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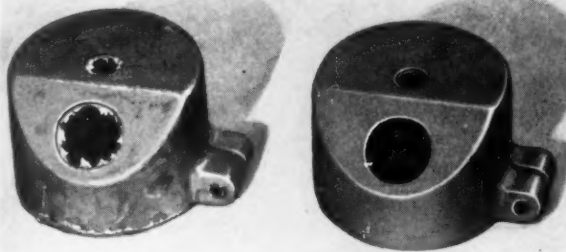


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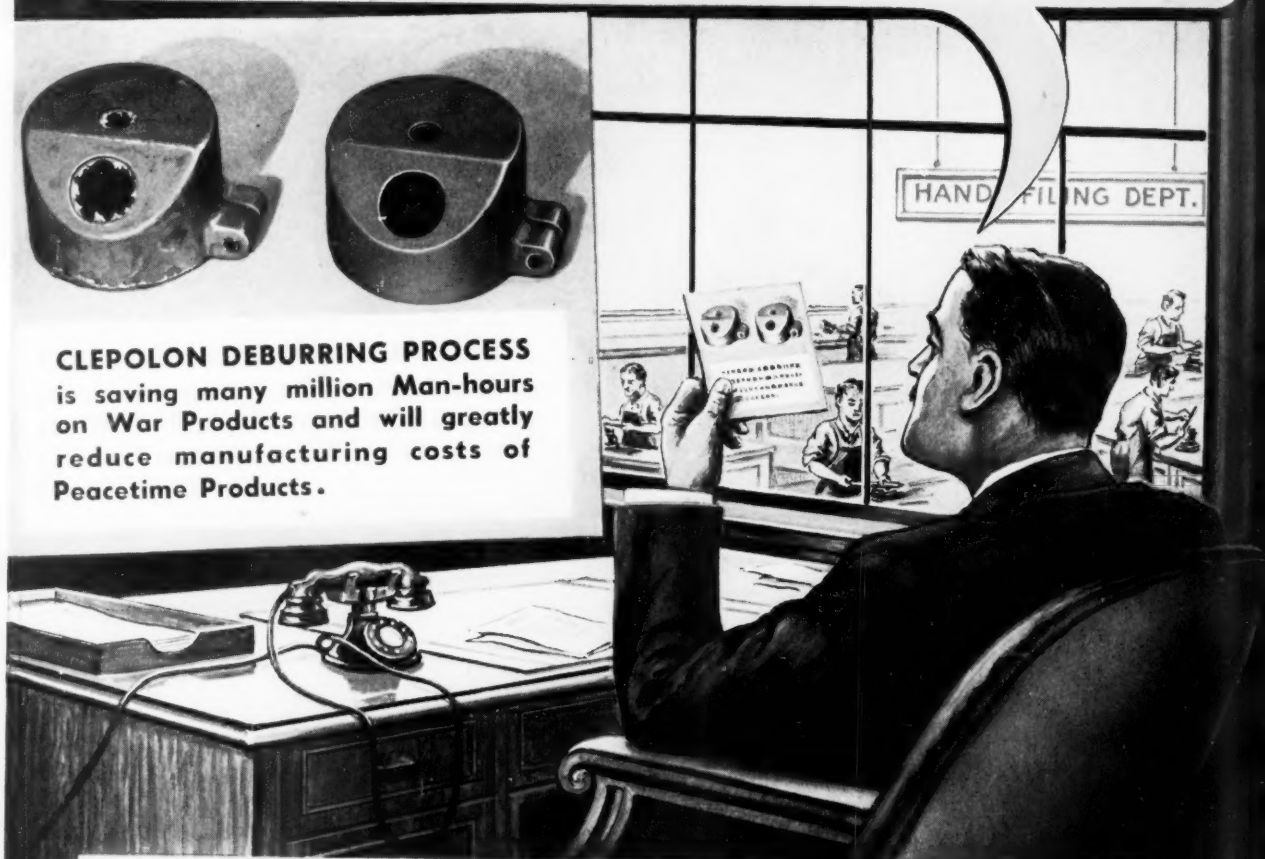
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before



after

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## Price Ceilings on Finishing Services

Maximum Price Regulation 581, the details of which will be found in this issue of Metal Finishing, appears to be a fair order, as O. P. A. orders go, and the industry representatives, who contributed their efforts with the view of avoiding hardship and making the order workable, are to be congratulated.

The small and odd lot finisher, who is least qualified to cope with the formal requirements of regulations, and most of whose orders run below one hundred dollars, is relieved of the task of keeping estimated cost records on such jobs. Pricing formulas must be based on March 1942 costs, which will not be welcomed by shops accustomed to using a flat man-hour charge, especially on polishing time, and where labor costs have risen appreciably since that date. Shift premium and overtime charges, however, may be based on current rates.

On new work, prices may be determined on the basis of actual experience in a trial run. Since this price will apply to the whole contract, we believe it will be advisable to include in price quotations the provision that the price is based on the same quality of finish, as furnished in the trial run, and on the supplying of raw stock in the same condition as supplied for the trial run. The effect of variations in basis metal condition on finishing costs is too well known to require further comment.

Statements of maximum list prices or rates and pricing methods must be filed with O. P. A.,\* which, in view of the all-too common practice of guessing at the price or agreeing to charge the same price as a competitor, without knowing whether the competitor made or lost money on the contract, will be a task of no mean proportions for a good many shops. Although provision is made for maximum price adjustments, no adjustment will be permitted if customers are able to obtain the same or fairly equivalent service from other suppliers.

We warned our readers last month, before receiving notification of the issuance of MPR-581, that reputable firms might be placed in the unfortunate position of having the price on an article frozen at an unprofitable level by the price-cutting policy of some members of the industry. Since, when applying for adjustment, it will be necessary to furnish the price charged by competitors where possible, the prospects of obtaining approval do not appear very bright in such cases.

\* Filing date has been advanced 1 month to May 31.

# The Deposition of Metals From Fluoborate Solutions

By HAROLD NARCUS

Chief Chemist, Plating Processes Corp., Holyoke, Mass.

IN the past, the successful deposition of the various metals from the metalliferous fluoborate electrolyte has been limited to the electroplating of lead, lead alloys and indium coatings. However, with the present availability in the chemical market of the so-called "solution concentrates," which contain the metallic fluoborate in a concentrated form, the electrodeposition of the other common metals, such as tin, cadmium, zinc, copper and iron in addition to nickel, chromium and silver is now feasible. These "concentrates" are presently commercially obtainable as approximately 40%-50% solutions of the metal fluoborate in water in addition to small percentages of free fluoboric and boric acids. This eliminates the necessity for handling hazardous hydrofluoric acid by the operator and the subsequent dangerous procedure of reacting boric acid with hydrofluoric acid. The "concentrate" requires only dilution with water and additional simple, rapid adjustments to make up an operating plating solution. Hence, the dissolving time to formulate a bath of the required plating strength is greatly lessened. Furthermore, the resulting electrolyte contains the proper amount of metal, free fluoboric acid and the slight excess of boric acid over that required to react with hydrofluoric acid.

Formerly, the preparation of this type of bath using basic ingredients was difficult to the average operator with only a limited knowledge of chemistry since the concentration of free fluoboric and boric acids is most important for producing satisfactory deposits meeting all requirements. The presence of this free fluoboric acid is particularly important since it increases the conductivity of the various solutions and gives finer-grained deposits with less tendency towards treeing. This effect is probably attributed to the fact that the free acid causes some decrease in metal concentration. The presence of the excess boric acid above that required to react with hydrofluoric acid as shown in the following chemical reaction:



while having little effect on the character of the deposit obtained is desirable since there is a marked reduction in the tendency for the fluoborate to decompose and, as a result, a possible precipitation of the metallic fluoride. Moreover, using the former tedious methods, there is a possibility of an appreciable excess of hydrofluoric acid in the solution over that required to chemically form the fluoborate. Likewise, its presence is liable to produce the fluoride of the metal. It can, therefore, be readily seen that extreme care must be exercised in the formulation of the various fluoborate plating solutions. This critical preparation is probably the reason

for the scarcity of this type of electrolyte in the average plating-room. Fortunately, with the advent of the previously mentioned fluoborate "concentrates," the plater may now secure a plating bath of the proper chemical composition which will offer outstanding results.

Generally the fluoborate bath shows the following marked advantages over most conventional plating solutions depositing the same metal:

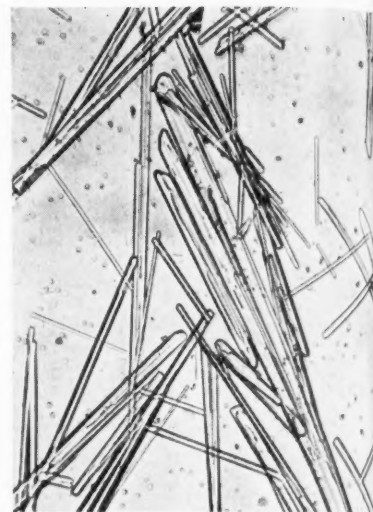
1. Simplicity and rapidity of bath preparation
2. Increased cathode efficiency
3. Increased anode efficiency
4. Simplicity of operation at room temperature
5. Less fluctuation in bath composition
6. Fine-grained deposits
7. Relatively high throwing power.

The methods of procedure, operating conditions and characteristics of these metal fluoborate baths, whose "concentrates" are commercially obtainable from several sources will be discussed in this paper. These include the lead and lead-tin alloy baths and also the tin, cadmium, zinc and indium fluoborate solutions. Although concentrated solutions of copper, iron, chromium, nickel and silver are also commercially available, the writer has not submitted them to plating tests and, therefore, they will be omitted from the present discussion. However, these latter "concentrates" warrant investigation since they may offer the plater unique features hitherto unobtainable in the presently used plating solutions.

## Lead Baths

Although lead has been deposited from a variety of solutions among which may be listed solutions of nitrate, acetate, perchlorate, oxalate, dithionate, sulfamate, plumbite and cyanide, the fluosilicate and the fluoborate baths are the two most commonly used. The fluoborate bath, however, shows many advantages over the fluosilicate electrolyte; namely, a resulting finer-grained, denser deposit; a bath less susceptible to decomposition and, hence, less sludge formation and a more satisfactory lead deposit directly on steel. Unfortunately, the lead fluoborate bath is more expensive than the fluosilicate.

The lead fluoborate "concentrate" is available from many sources on the market as a 66°-67° Bé. solution and contains 68 ounces of metal per gallon. Although any desired plating concentration is prepared by diluting the "concentrate" with the proper amount of water, the dilution to obtain a bath for general plating is 1 part by volume of the "concentrate" and approximately 4 parts by volume of water. In order to prevent any



(Courtesy of the General Chemical Company)  
Figure 1

subsequent precipitation of lead fluoride 2-3 ounces per gallon of additional free boric acid is usually added. This mixture will give a bath composition of 13.4-14.2 ounces per gallon of lead (as metal). The "concentrated" bath (for barrel-plating and heavy deposits) and the "dilute" bath (for light deposits) recommended by Gray and Blum [Trans. Electrochemical Soc., 80, 657 1941] are made from the proprietary concentrated solution by dilution of 1 part of the "concentrate" by volume with approximately 1.1 parts and 3.2 parts by volume of water respectively.

The so-called "dilute" bath should be operated at a current density of 5-50 amperes per square foot or at an average current density of 20 amperes per square foot for deposits which are light (up to 0.001" thickness). Heavy deposits, desired from this same bath, are obtained at 10 amperes per square foot. The "concentrated" solution employs 5-70 amperes per square foot with an average current density of 30 amperes per square foot for lighter deposits and 20 amperes per square foot for heavy deposits up to 0.05" in thickness. As previously stated, however, for general use the bath made up by diluting 1 part by volume of the "concentrate" with approximately 4 parts by volume of water is entirely satisfactory. When operated at 10-40 amperes per square foot the cathode efficiency is 100%.

The baths described in the preceding paragraphs employ a voltage of 1 to 4 in still tanks and about 6 for barrel plating. The operating temperature is usually in the range between 77° F. and 105° F. Cooling is necessary if the bath temperature exceeds

105° F. The pH of the bath should be between 1.0 and 1.5. This acidity is best controlled by additions of 42% fluoboric acid when the pH rises above the maximum figure. This fluoboric acid is also obtainable commercially from several sources prepared as a 42% solution.

In regards to the necessary equipment for use in the lead fluoborate bath, the tank should preferably be rubber-lined steel although stoneware, glass-ware or asphalt-lined wood can be used without experiencing any difficulties. Lucite, phenol-formaldehyde resins of the various types or hard rubbers may be employed for plating barrel construction. Owing to the fact that the bath operates at such a low pH value all metal parts in the tank set-up must be protected in the usual manner with suitable synthetic coatings. Care must be taken to see that no work is dropped to the bottom of the plating-tank and allowed to remain there for long periods of time. The anodes employed should be of "corroding" lead or pure chemical lead since insoluble impurities in the anode material, not made from high purity lead, will form an anode sludge film which causes a marked increase in the operating bath voltage. Furthermore, this undesirable condition may result in an increased tendency towards the formation of both rough and treed deposits. The anode

be first dissolved in warm water (after soaking for several hours in cold water) prior to adding it to the plating bath.

The lead fluoborate bath is simple to control by chemical analysis; the lead (as metal), free fluoboric acid and addition agent concentration being the controlling factors in the bath. Detailed analytical procedures are given in the previously mentioned technical paper by Gray and Blum. The lead is precipitated as  $PbSO_4$ , dried and weighed as the sulphate. The free fluoboric acid is titrated with 1N KOH; further titration in the presence of phenolphthalein indicator gives the total fluoborate content. The boric acid content can be determined occasionally in the usual manner. The Hull cell is used to effectively determine if sufficient glue is present as the addition agent.

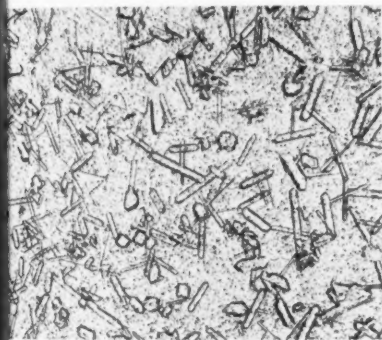
The recommended cleaning procedure for preparing ferrous materials for lead plating in the fluoborate bath is an anodic electrolytic cleaning in any good proprietary cleaner followed by a pickle for 15-20 seconds in a 5-10% sulphuric acid dip. This pickling operation may be substituted by steel-shot blasting especially if the lead deposit is to withstand elevated temperatures. Although a cyanide copper strike is recommended it is not imperative. This strike, with low free cyanide content, is absolutely necessary when lead is to be deposited upon aluminum using any of the prevailing methods for this purpose, or upon zinc or white metals. In the event a subsequent soldering operation will be performed, a copper strike is also necessary.

It is most important that the deposited lead be free from porosity since lead is cathodic in industrial atmosphere to iron and will accelerate its corrosion if the lead plate possesses porosity to any degree or its continuity is broken by mechanical abrasion. The lead deposit, however, is more anodic

to iron than nickel or copper and, therefore, offers greater protection. This is particularly true in ocean atmospheres. On most applications where the lead-plated part is subjected to outdoor exposure, a minimum deposit of between 0.0005" and 0.001" thickness should be used. In the case of protection against severe industrial atmospheres a fine-grained deposit between 0.0015" and 0.002" should be applied, although the presence of chloride ion in the atmosphere increases the protective ability of the lead coating. Scratch-brushing or slight burnishing will increase the protective value of the lead plate. Recently published salt-spray tests (J. F. Beal—August, 1944 Monthly Review) have shown that 0.0001" thickness of lead deposited from the fluoborate bath will give 18-30 hours salt-spray resistance; 0.00025"—a minimum of 24 hours; 0.0005"—50 hours minimum and 0.001" thickness of lead—100 hours minimum and as high as 200 hours salt-spray resistance.

In concluding the discussion of the lead fluoborate bath and as an aid to the plater in the use of this particular plating solution, it would be well to review the conclusions drawn by Blum and Co-workers [Trans. Electrochemical Soc., 36, 257 (1919)]:

1. By increasing the concentration of metal in the bath it is possible to employ higher current densities without causing treed deposits.
2. An increase in current density increases the tendency towards treening but produces finer-grained deposits. Therefore, the highest current density should be used that will not produce appreciable treening, since there is less porosity in finer-grained deposits.
3. By increasing the concentration of the free fluoboric acid there is a somewhat less tendency to form trees.



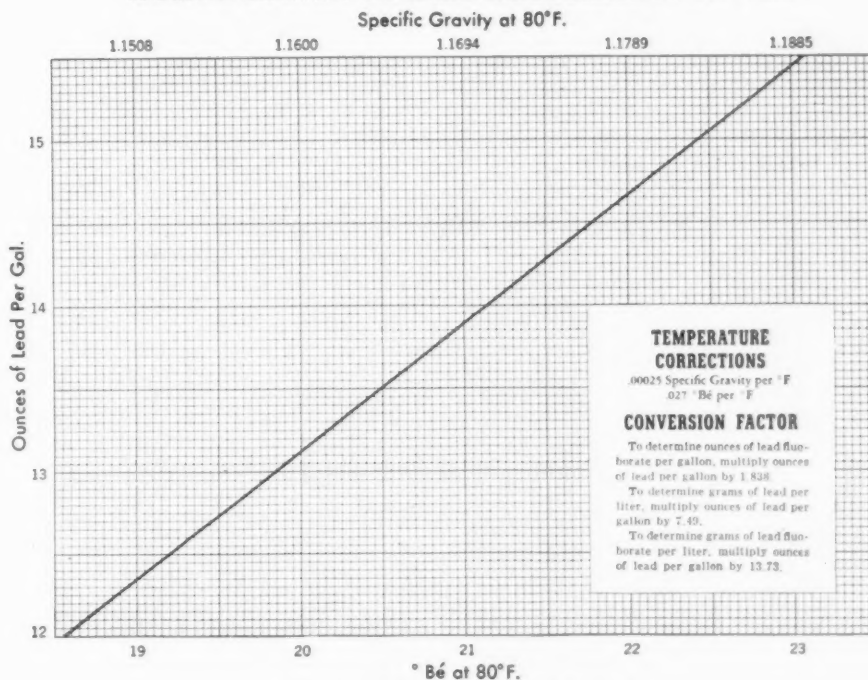
(Courtesy of the General Chemical Company)

Figure 2

current density should be in the range of 0.25 amperes per square foot. At this anode current density the lead fluoborate bath operates at 100% or more anode efficiency and, as a result, no agents to accelerate anode corrosion are necessary. Mechanical agitation, such as movement of the cathode bar, produces smoother, denser deposits but should only be used in the case of clean filtered solutions.

Addition agents are employed in the lead fluoborate bath since, when present in the proper concentration, they tend to increase the covering power of the bath and lessen the tendency for the lead deposit to show appearance of pin-holes, treening or even roughness. Materials such as glue or gelatin are most generally used although Betts (U. S. Patents No. 713,277 and No. 713,278) has patented the use of such organic substances as pyrogallol, resorcinol, saligenin, orthoaminophenol and hydroquinone as addition agents. Bone glue, in concentrations of 0.02-0.05 ozs. per gallon has answered the purpose of an addition agent in the lead fluoborate bath splendidly. It should

### SPECIFIC GRAVITY OF LEAD FLUOBORATE SOLUTIONS



(Courtesy of the General Chemical Company)

Figure 3



# **RATE OF LEAD DEPOSITION FROM LEAD FLUOBORATE BATH** (100% CATHODE EFFICIENCY)

Thickness in In.	.0002	.0004	.0006	.0008	.0009	.0010	.0015	.0020	.0030	.004	.005	.006	.008	.01	.02	.05	.10
Oz. per Sq. Ft.	.188	.376	.564	.752	.846	.94	1.410	1.88	2.820	3.76	4.70	5.64	7.52	9.4	18.8	47.0	94.0
Amp/ft <sup>2</sup>	Time in Hours and Minutes																
5	:1656	0:33	0:50	1:06	1:15	1:23	2:04	2:46	4:08	5:32	6:54	8:16	11:04	13:48	27:36	69:00	138:00
6	:1380	:28	:41	:56	1:03	1:10	1:45	2:19	3:29	4:37	5:45	6:58	9:14	11:30	23:00	57:30	116:40
7	:1180	:24	:35	:48	:54	:59	1:28	1:58	2:57	3:56	4:56	5:54	7:52	9:51	19:42	49:17	98:34
8	:1036	:21	:31	:42	:48	:52	1:18	1:43	2:35	3:26	4:19	5:10	6:52	8:38	17:16	43:07	86:14
9	:0920	:18	:28	:36	:42	:46	1:09	1:32	2:18	3:04	3:50	4:36	6:08	7:40	15:20	38:20	76:40
10	:0828	:17	:24	:34	:36	:42	1:03	1:23	2:05	2:46	3:27	4:10	5:32	6:54	13:48	34:30	69:00
15	:0552	:11	:16	:22	:24	:28	:42	:56	1:23	1:51	2:18	2:46	3:41	4:36	9:12	23:00	46:00
20	:0414	:083	:124	:166	:186	:21	:32	:42	1:03	1:23	1:44	2:06	2:46	3:27	6:54	17:16	34:32
25	:0332	:066	:100	:132	:150	:17	:25	:33	:50	1:06	1:23	1:40	2:12	2:46	5:32	13:48	27:36
30	:0276	:055	:082	:110	:123	:14	:21	:28	:42	:55	1:09	1:24	1:50	2:18	4:36	11:30	23:00
35	:0236	:047	:070	:094	:105	:12	:18	:24	:36	:47	:59	1:12	1:34	1:58	3:56	9:51	19:42
40	:0208	:042	:062	:084	:093	:10	:16	:21	:32	:42	:52	1:04	1:24	1:44	3:28	8:38	17:16
45	:0186	:037	:056	:074	:084	:09	:14	:18	:28	:37	:46	:56	1:14	1:32	3:04	7:40	15:20
50	:0166	:033	:050	:066	:075	:08	:13	:16	:25	:33	:41	:50	1:06	1:23	2:46	6:54	13:48
60	:0138	:028	:042	:056	:063	:07	:11	:14	:22	:28	:35	:44	:56	1:09	2:18	5:45	11:30
70	:0118	:024	:036	:048	:054	:06	:09	:12	:18	:24	:30	:36	:48	:59	1:58	4:55	9:51

EXAMPLE 1:15 = 1 hour 15 minutes

(Courtesy of the General Chemical Company)

Table I

- The presence of excess boric acid, while not effecting the deposit, reduces the tendency for decomposition of the lead fluoborate and any formation of lead fluoride sludge.
- By the addition of the proper amount of glue there is less tendency for the deposit to form trees and the deposits are finer-grained.
- Baths operated at ordinary room temperatures are entirely satisfactory.

## **Tin Baths**

Previously no satisfactory method for the commercial preparation of tin fluoborate was found, undoubtedly due to the fact that there exists no tin compound, such as stannous hydroxide, for example, which could be economically dissolved in fluoboric acid without introducing any other acid or metallic radicals. However, at present, the availability of a tin fluoborate "concentrate" allows the plater to utilize the tin fluoborate plating bath for obtaining electro-deposits of tin from such electrolytes. Thus, another type of plating bath is added to the other more commonly used tin plating electrolytes, namely, the sulfate, stannate, halo-

gen and modified halogen baths. The sulfate, halogen types and fluoborate are acid baths and the stannate is an alkaline bath.

The tin fluoborate "concentrate" commercially obtainable is a 45%-50% water-white solution containing approximately 20% of tin (as metal). The "concentrate" also contains 3%-4% free boric and fluoboric acids in its typical analysis.

As previously pointed out the tin fluoborate solution is acidic in nature and, therefore, operates at a cathode efficiency of 95%-100%; undoubtedly due to the fact that tin is bivalent in an acid bath while tetravalent in an alkaline bath. The resistance of the acid bath is  $\frac{1}{4}$  to  $\frac{1}{2}$  that of the alkaline bath. Due to the high electrical conductivity of the tin fluoborate solution the tin anodes dissolve with such anode current efficiency that maintenance of the bath is not difficult. An insoluble precipitate of tin oxide is less liable to form in an acid bath than in an alkaline bath. Furthermore, the simplicity of the tin fluoborate bath makes it less difficult to control in plant production. The bath operates effectively at room temperature with excellent throwing power. This

is an additional advantage since alkaline tin baths must be heated for best results.

In commercial practice, approximately part of the tin fluoborate "concentrate" diluted with 3 parts of water. The resulting plating solution, after additional fluoboric acid (as 42% fluoboric acid) and boric acids are added, will possess the following composition:

Stannous fluoborate	200 g./L. (26.8 oz./gal.)
Tin (as metal)	81 " (10.8 ")
Fluoboric acid	42-60 " (5.6-8.0 ")
Boric Acid	22-30 " (2.9-4.0 ")

In barrel plating solutions the concentration of the stannous fluoborate in the plating formulation is doubled, the concentration of the fluoboric acid and boric acid remaining the same.

The addition agents used in the tin fluoborate bath are the same as for the conventional acid baths, namely, glue, lignin, rosin and beta-naphthol in concentrations of 6, 1, and 1 g./L. respectively. These materials are best added to the tin fluoborate bath in the following manner: dissolve the addition agents (after soaking the glue)

(Continued on page 199)

# **RATE OF TIN DEPOSITION FROM THE STANNOUS FLUOBORATE BATH** (100% CATHODE EFFICIENCY)

Thickness in Inches	.0001	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.001	.002	.003
Oz. per Sq. Ft.	0.0607	.1214	.1821	.2428	.3035	.3642	.4249	.4856	.5463	.6070	1.214	1.821
Amp/ft <sup>2</sup>	Time in Hours and Minutes											
5	:094	:188	:28	:37	:47	:56	:66	:75	1:24	1:34	3:07	4:41
10	:047	:094	:14	:19	:24	:28	:33	:37	:42	:47	1:34	2:21
15	:031	:062	:09	:12	:16	:19	:22	:25	:28	:31	1:02	1:34
20	:024	:047	:07	:09	:12	:14	:16	:19	:21	:23	:47	1:10
25	:019	:037	:056	:07	:09	:11	:13	:15	:17	:19	:37	:56
30	:016	:031	:047	:06	:08	:09	:11	:12	:14	:16	:31	:47
35	:013	:026	:040	:05	:07	:08	:09	:11	:12	:13	:27	:40
40	:011	:024	:035	:047	:06	:07	:08	:09	:11	:12	:24	:35
45	:010	:021	:031	:042	:05	:06	:07	:08	:09	:10	:20	:31
50	:009	:019	:028	:037	:047	:056	:066	:075	:08	:09	:18	:28

EXAMPLE: 1:24 = 1 hour 24 minutes

(Courtesy of the General Chemical Company)

Table 2

# Inspection Tests for the Adhesion of Electroplated Coatings With Particular Reference to the B.N.F. Adhesion Test

By A. W. HOTHERSALL and C. J. LEADBEATER

## Introduction

AN ADHESION test suitable for use in the inspection of electroplated coatings of nickel and chromium and of other metals has been developed. The lack of a suitable test has been a notable omission in specifications of electroplated coatings,<sup>1</sup> and the need for a reliable test of general application has been expressed by the Committee of the British Standards Institution which is engaged in formulating specifications for electroplated coatings.

Whilst weak adhesion is sometimes revealed by detachment of the deposit during plating or finishing processes, poorly adherent coatings are often passed out into service, where they may peel or blister owing to the effects of corrosion or local abrasion or a combination of both. Corrosion tests of nickel plated steel and aluminum have shown that poorly adherent coatings tended to blister rapidly and extensively when the coating was thin and porous, whereas strongly adherent coatings remained free from blisters for a longer period, although locally pitted at the site of pores on the coating. Since the chief criterion of failure of nickel and chromium plating for many purposes is the inability to restore the original appearance by cleaning, the rejection during inspection of non-adherent or very poorly adherent coatings is a matter of great importance.

The numerous methods which have been proposed for testing the adhesion of protective metallic coatings may be broadly divided into two classes:

- (1) Those methods in which the coated article is permanently deformed (e.g., by bending, hammering, extending, indenting, cupping, twisting, etc.).
- (2) Those methods in which the coating is scraped, pulled or levered from the base; for reliable results, thin coatings must be reinforced in some suitable way, for example, by building up to allow a grip to be obtained. An allied method is burnishing, in which the coating is locally extended.

None of these methods is suitable for general use in the inspection of protective coatings due to difficulty of standardization; for example, tests involving deformation of the coated metal vary in their severity according to the relative properties of base and of coating and also to the thickness of the coating, being most severe for a thick, hard, brittle deposit and least severe for a thin, soft, ductile coating; they involve destruction of the article tested and are not applicable to all types of article. Methods of reinforcing

the coating to enable a tearing stress to be imposed on the junction are either slow (building up) or involve the use of heat (soldering), which may improve the degree of adhesion.

A skilled operator can detect a poorly adherent coating by burnishing or by careful cutting and scraping with a sharp blade. Success with these methods is, however, dependent to a large extent on the experience of the operator, and the reliability of these tests varies with the properties of the deposit and of the basis metal.

An ideal adhesion test for use in the inspection of plated coatings would be independent of the following variables:—skill of the operator, composition and properties of the basis metal, properties of the deposit, presence of undercoatings, thickness of deposit (e.g., within the range 0.0001–0.002"), shape and size of article. It would also be capable of detecting poor adhesion locally as well as generally and would not be critically dependent on the conditions of testing. It would not damage the article so that repair by replating could not be undertaken.

It has been assumed in this work that an inspection test will only be needed for coatings, within the above range of thickness, on a smooth surface, and that it will only be required to detect non-adherent or, at the best, very slightly adherent coatings.

Three types of tests have been investigated; each type embodied the same principle for indicating weak adhesion, viz., the deposit was made to extend, generally or

locally according to the test employed, resulting in flaking or blistering at non-adherent areas. In general, the three methods, A, B and C, differed only in the means of producing the expansion of the coating; methods A and B employed the principle of subjecting the coating locally to a multitude of light blows which caused it to extend, especially near its surface, poor adhesion being shown by the formation of blisters.

**A.—The B.N.F. Adhesion Test.** A vibrating ball-ended hammer, actuated by a fluctuating magnetic field, was used to bombard the surface.

**B.—Shot Impingement Test.** The surface was bombarded with rounded steel balls such as the steel shot ordinarily used for shot blasting.

**C.—The Electrolytic Test.** The component under test was made the cathode in a solution of dilute sulphuric acid, with the result that the deposit became saturated with hydrogen, which diffused into the nickel. Weak adhesion was shown by blistering, or by cracking and exfoliation of the deposit over the area tested.

Methods B and C are of less importance than method A because of disadvantages described below and have therefore been relegated to the Appendix.

## The B.N.F. Adhesion Test

### Description of Apparatus.

After a number of trials with vibrating hammers actuated in different ways, an ap-

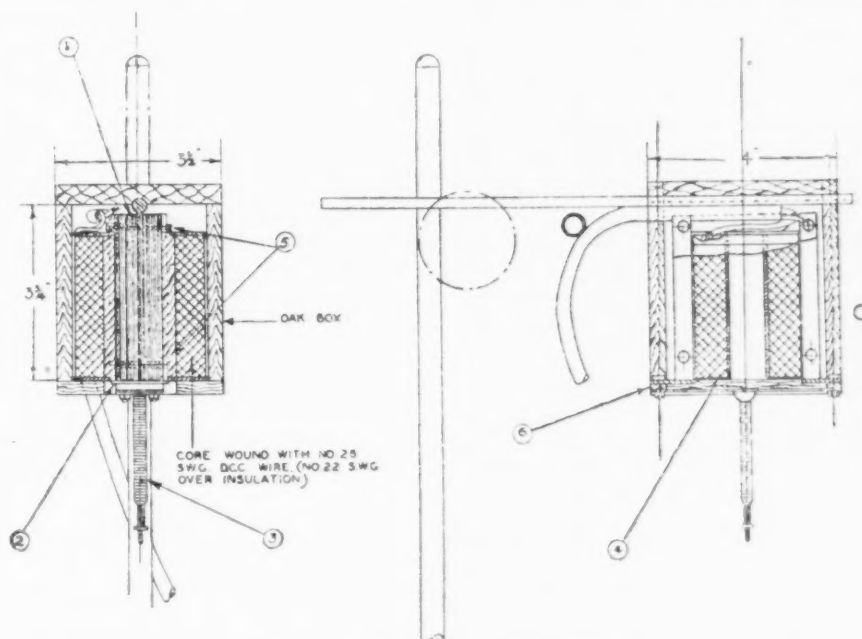


FIG. 1.—B.N.F. Adhesion Tester.

\* See Fig. 2.

Paper presented to the Electrodepositors' Technical Society at the Northampton Polytechnic, London, E.C.1, on Monday, 24th April, 1944. Reprinted here with the permission of the Society.

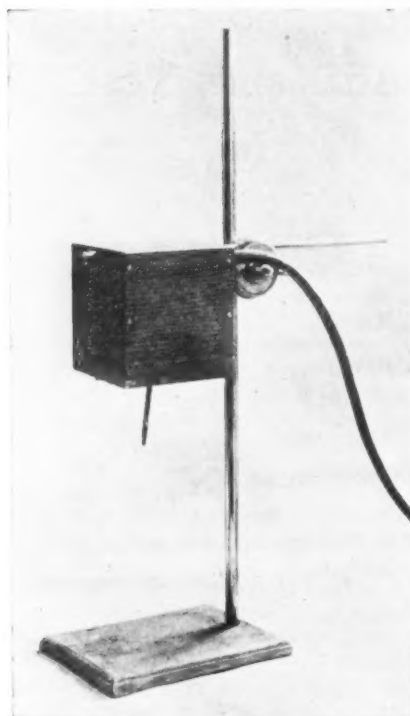


Fig. 2. Laboratory model of B.N.F. adhesion tester.

paratus was developed which was found to give satisfactory results on articles of various shapes. In preliminary tests, hammers were fixed to the arm of an electric bell assembly, but this method was not readily applicable to recessed areas. It was found that a more satisfactory method was to fix the hammer to a reed which was mounted adjacent to an electro-magnet actuated by alternating current.

The laboratory model of the apparatus is illustrated in Figs. 1 and 2. An E-shaped yoke (1), 1.0" width, was built from stalloy transformer laminations, and was fitted with a bobbin wound with cotton-covered wire (24 S.W.G.). A bracket of brass (2) attached to each of the side legs of the yoke served the double purpose of fixing the yoke to an oak hood and also of holding the steel reed, 4 x 1 x 0.02" in size, which was bolted on to two cushions of solid rubber (6).

In order to allow the blows of the hammer to be distributed over a small area and thus to encourage the production of a blister, the hardened steel hammer (3) with a spherical head, 0.06" in diameter, was mounted in a piece of spring belting 3/16" diameter, 2 1/2" long, which was soldered to the reed, thus giving a flexible hammer. When completely assembled the apparatus was suspended by the hood from a steel rod which was adjustably clamped to a retort stand (Fig. 2). The test was applied by holding the component under the hammer which was loosely guided by the fingers. Blisters were usually formed in weakly adherent coatings within ten seconds; if the coating did not blister within one minute, the test was discontinued.

#### Investigation of the B.N.F. Test.

##### 1. Degree of Adhesion.

Since it was assumed that, for inspection purposes, the test would only be required

to detect non-adherent or, at the best, only slightly adherent coatings, difficulty was experienced in obtaining a standard of reference by which the validity of the test could be established.

Several methods are available and are used in electroforming processes for producing deposits with so slight a degree of adhesion that they can be readily peeled off; for example, brushing the surface with graphite or treatment with solutions which produce films on the surface (sulphide solutions, dichromate solutions). It was considered that the degree of adhesion obtained by these treatments was sufficiently small for the coatings to be classed as non-adherent.

Other methods which were used in this work to give a similar low degree of adhesion were:

- (i) Dipping in a solution of copper carbonate in ammonia (composition:—Copper carbonate 45 g. ammonia [sp. gr. 0.880] 110 ml., water 350 ml., temperature—70°C., time of treatment 1 minute).
- (ii) Cathodic treatment for 4 minutes at 50 amp. per sq. ft., in a stock alkaline cleaning solution, originally made to the composition 50 g. per litre of sodium hydroxide, 50 g. per litre of sodium carbonate, using nickel anodes; as previously shown,<sup>2</sup> the degree of adhesion of electrodeposited nickel to brass which was treated in this way before deposition decreased progressively with increase in the time of treatment, due to the slow deposition of a film of powdery deposit.

Soft nickel deposits, 0.0005" in thickness, were prepared on brass sheets which had been cathodically treated for progressively increasing times in the alkaline solution before nickel deposition, and were tested by the B.N.F. adhesion test. No blisters were formed in the deposits prepared on brass which had been treated for less than 4 minutes but with 4 or more minutes' treatment, blisters were produced; when the latter deposits were tested by careful scraping with a sharp blade, they could be peeled off the brass. Scouring of the brass with precipitated chalk after the cathodic treatment removed the powdery deposit and resulted in a more strongly adherent nickel deposit, which could not then be blistered in the B.N.F. test. Nickel deposits, 0.0005" in thickness, on

brass sheets which had been pre-treated to render the deposit non-adherent by all other methods mentioned above, were blistered within 10 seconds by application of the B.N.F. adhesion test.

Only two methods were available for producing coatings with a measurable degree of adhesion which was low but even and fairly reproducible:

(A) Using as a basis metal brass which had been rubbed with coarse emery paper or cloth and prepared for nickel plating by a cleaning method involving no etching. Nickel deposits prepared in this way can be easily peeled off with the fingers, the fracture occurring in the surface of the brass, a film of which is found on the under side of the detached deposit. The degree of adhesion, determined quantitatively, was found to vary from approximately 0.5–2.3 tons per sq. inch according to the method of preparing the surface and, by applying the B.N.F. adhesion test to a surface adjacent to that from which the deposit was pulled in the quantitative test, it was possible to obtain a direct comparison between the two methods on individual test pieces and thus to attempt to determine the limiting degree of adhesion above which blisters could not be formed in the B.N.F. test.

For this purpose, the quantitative adhesion test previously described by the authors<sup>2</sup> was suitable; the test pieces consisted of brass rods (60:40) fitted with brass bushes, the face of the rod being exactly flush with that of the bush. The common face of rod and bush was rubbed with coarse emery cloth and the test pieces were cathodically cleaned in a cold alkaline solution (sodium hydroxide plus sodium carbonate), with and without previous immersion in a boiling metal cleaning solution (sodium carbonate plus sodium silicate), followed by scrubbing with precipitated chalk. The whole of the specimen was then nickel plated to an average thickness of 0.0008", and the B.N.F. adhesion test was applied to that face of the bush which had been rubbed with emery. The test piece was then stopped off in the usual way and built up with nickel to the required thickness (about 0.03" for this degree of adhesion); the load required to pull the rod out of the bush was determined in an Amstutz testing machine and provided a measure of the degree of adhesion. The results are shown in Table 1.

(B) Depositing nickel on tinplate, the

TABLE 1.—COMPARISON BETWEEN B.N.F. ADHESION TEST AND DEGREE OF ADHESION.

CLEANING PROCEDURE.	QUANTITATIVE ADHESION TEST.		B.N.F. ADHESION TEST.
	load lbs.	tons/sq. in.	
Cathodic alkali ... ..	142	0.57	no blistering
Chalk scrub ... ..	197	0.79	" "
Hot cleaner; cathodic alkali;	305	1.22	" "
Chalk scrub .. ...	580	2.32	" "



TABLE 2.—APPLICATION OF B.N.F. ADHESION TEST TO COATINGS OF VARIOUS HARDNESSES AND THICKNESSES.

COATING.	HARD- NESS D.P.H.*	BASIS METAL	THICKNESS (INCH)		
			THIN	MEDIUM	THICK
Chromium ... ..	900	Brass	—	0.0005 0.001	—
Nickel	Bright Sulphonate type (a)	545	—	0.0005	0.003
	Bright poly-sulphonate type (b)	545	—	0.0005	—
	Bright Nickel Cobalt type (c)	430	—	0.0005	0.003
	Double salt ... ..	260	—	0.0005	—
	Single salt ... ..	150†	0.0001 0.00025	0.0005 0.001	0.003 0.006
Copper (Cyanide) ... ..	150†	Mild Steel	—	0.0005	—
Cadmium (bright) ... ..	53†	Mild Steel	—	0.0005	—
Zinc ... ..	50†	Mild Steel	—	0.0005	—
Tin ... ..	8†	Mild Steel	—	0.0005	—
Nickel-chromium ... ..	—	Brass	—	0.001	—

\* Hardness values obtained in other work under similar conditions of deposition.

† Brinell hardness numbers.

(a) U.S.P. 1,818,229. (b) U.S.P. 1,972,693. (c) U.S.P. 2,026,718.

pared on basis metals of various hardnesses (see Table 3).

With the exception of the lead specimens the tests were carried out in the normal way. It was found necessary to bombard coatings on lead with blows of small amplitude, obtainable in practice simply by damping down manually the vibration of the hammer.

Blisters were not produced on any of these basis-metals when a cleaning procedure

known to give strong adhesion was employed prior to plating; the surface was, however, matted by the hammer blows (Fig. 4).

Sections were prepared for micro-examination to show the effect of the bombardment of plated hard steel and annealed copper specimens by the hammer. The deposit was found to have been slightly thinned, more especially on the hard steel, in the area bombarded, but there was no evidence of any

TABLE 3.—APPLICATION OF B.N.F. ADHESION TEST TO COATINGS ON VARIOUS BASIS METALS.

BASIS METAL.		THICKNESS OF DEPOSIT (INCH)			
	HARDNESS BRINELL No.	COPPER.		NICKEL.	
		0.0005	0.003	0.0005	0.003
Lead ... ..	5	*	*	*	—
Aluminium ... ..	30	—	—	*	—
Brass ... ..	80	—	—	*	*
Mild Steel ... ..	100	*	—	*	—
Hardened Steel ...	400	—	—	*	*

\* Tests applied and deposits blistered.

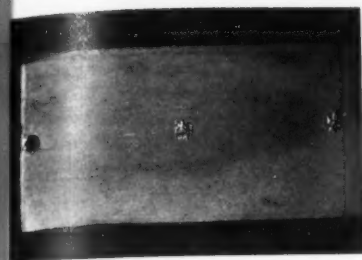


Fig. 3. Blisters produced in nickel deposit on aluminum by the B.N.F. tester.

adhesion of the coating probably lying within the range 0.75–1.5 tons per sq. inch according to the thickness of tin.<sup>3</sup> Application of the B.N.F. adhesion test for extended times to soft nickel deposits 0.0005" in thickness, on various grades of tinplate failed to produce blisters.

The above results confirm the suggestion, made on the basis of the qualitative tests referred to above, that blisters are only produced in the B.N.F. test with non-adherent or very slightly adherent coatings.

Tests of the effect of variables such as time of testing, size of hammer head, amplitude of hammer blow, properties and thickness of deposit and hardness of basis metal were made using one of the methods, referred to above, of producing non-adherent coatings.

#### 1. Properties and Thickness of Coatings.

Blisters were produced, usually within 10 seconds of commencing the test, in non-adherent coatings having a wide range of hardness and thickness; the tests included single and composite deposits. Details of the tests are given in Table 2.

Well-formed blisters were produced over the range of thickness of nickel tested, except for the thinnest coatings (0.0001") which tended to flake when bombarded with the hammer; a round blister (Fig. 3) was formed in coatings of average thickness (0.00025–0.0015"), whilst an annular blister, with or without a central mound, was produced in the thickest coatings above 0.0015". Careful examination of the surface with oblique illumination appeared desirable with thick coatings (greater than 0.002–0.003") especially when hard and tough, since the blisters were sometimes difficult to detect. Difficulty was experienced in producing non-adherent deposits of chromium alone, and it was found necessary to deposit a thin coating of nickel-copper (e.g., 0.0002") as an undercoat.

#### 2. Hardness of Basis Metal.

Blisters were produced, within 10 seconds of commencing the B.N.F. Adhesion Test, in non-adherent nickel and copper deposits pre-

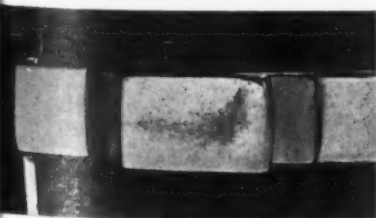


Fig. 4. Adherent nickel coating (no blisters).

TABLE 4.—B.N.F. ADHESION TESTS ON COMMERCIALY PLATED ARTICLES.

COMPONENT.	TOP COATING.	BASE.	B.N.F. ADHESION TEST.		BUILDING UP.	RAZOR BLADE TEST.	
			SIGNIFICANT SURFACE.	NON-SIGNIFICANT SURFACE.		SIGNIFICANT SURFACE.	NON-SIGNIFICANT SURFACE.
1. Radiator grille ...	Chromium ...	Brass	Unblistered	One blister	—	No separation	No separation
2. Lorry mascot ...	"	Zinc	Blistered	Unblistered	—	Separation* ...	—
3. Hub ...	"	Brass	Unblistered	"	—	No separation	No separation
4. Radiator caps ...	"	"	"	"	Strongly adherent	—	—
5. Radiator rib ...	"	"	"	Blistered	—	No separation	Separation
6. Small grills ...	"	"	"	"	—	"	No separation
7. Bracket ...	"	"	"	Unblistered	Slightly adherent	"	"
8. Bath waste ...	Bright nickel	"	"	Blistered	—	"	Separation
9. Bath waste ...	Matt nickel...	"	"	"	—	"	"
10. Globe-cock ...	Bright nickel	"	Blistered†	—	Slightly adherent	—	—
11. Lock frame ...	"	"	" §	Blistered	—	Separation	No separation
12. Door handle ...	"	"	" ‡	"	—	"	Separation
13. Ventilator ...	"	"	"	"	—	—	—
14. Head lamp ...	Chromium ...	"	Unblistered	"	—	—	—
15. Head lamp ...	Nickel	"	"	"	—	—	—

\* Separation was effected by filing a portion of a corner and peeling off.

§ See Fig. 5.

† See Fig. 6.

‡ See Fig. 7.



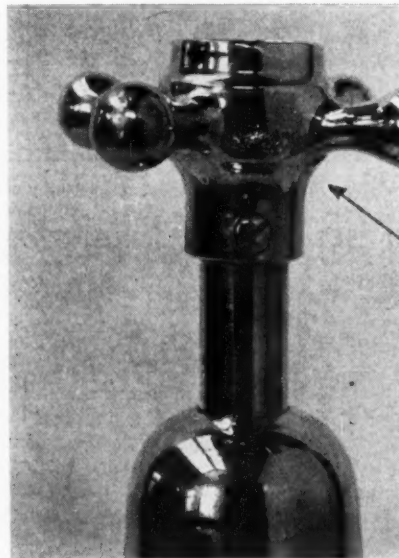
Fig. 5. Bright nickel on lock frame (blistered).

local penetration of the hammer into the soft copper such as might have tended to lock the deposit to the base; the surface of the copper showed only shallow undulations.

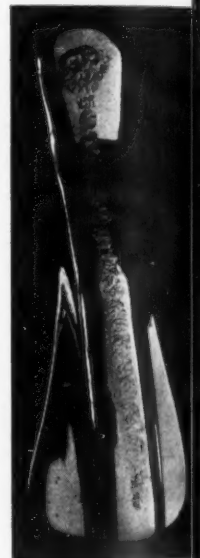
#### 4. Size of Hammer and Amplitude of Blow.

Hammers having diameters of head of 0.03, 0.06, 0.125 and 0.25" were tried. Blisters were produced in non-adherent nickel deposits, 0.0005 and 0.003" in thickness on brass, within 10 seconds with all these hammers. After some experiments it appeared that, whilst the diameter of the hammer head was not critical, the smaller sizes tended to produce more easily visible blisters in a shorter time; 0.06" diameter appeared likely to be the most serviceable.

Variations in the amplitude of blow, produced by holding the specimen at different distances from the hammer, did not appear to lengthen appreciably the time required to produce blisters except with thick deposits. With non-adherent nickel deposits, 0.0005" in thickness on brass, blisters were produced within 10 seconds with various



Left: Fig. 6. Nickel on brass globe cock (blistered).



Right: Fig. 7. Bright nickel on brass door handle (blistered).

amplitudes of blow using hammers 0.03, 0.06 and 0.125" in diameter; periods of up to 5 minutes were required with deposits 0.003" in thickness. There was, however, no difficulty in judging the maximum amplitude by adjusting the distance between hammer and specimen to give the maximum sound.

#### Application of the B.N.F. Adhesion Test to Commercially Plated Specimens.

Tests were made on 52 articles of various types which had been plated with nickel and chromium in different plating establishments. Typical results are shown in Table 4 and illustrated in Figs. 4-7. Check tests were made on a number of these components by (a) building up the existing deposit to a thickness of 0.01" and testing the adhesion with hammer and chisel or pliers, (b) scraping with a razor blade or scalpel. Good

agreement was found between the different tests, although, as might be expected, the B.N.F. test proved more reliable in detecting poor adhesion than scraping with a blade. Some coatings which could not be separated with a blade were readily detachable after being loosened locally by the vibrating hammer.

#### Applications to Coatings Formed by Metal Spraying, Sherardising, Painting, Etc.

The apparatus was developed primarily for testing electroplated coatings, but it may be useful for other types of coating, both metallic and non-metallic. This field has not been fully explored, but preliminary tests, made chiefly on sherardized and painted films, gave encouraging results.

(To be concluded in June)

# Ceilings for Metal Finishing Services

STATEMENT OF CONSIDERATIONS INVOLVED IN THE ISSUANCE OF MAXIMUM PRICE REGULATION 581

## I. Need for the Regulation

THIS regulation establishes maximum prices for industrial services. In general, these services comprise all jobbing shop operations performed in the fabrication of metals or metal products, all jobbing shop operations performed in the treatment, coating or finishing of metals or metal products, and plating on plastics and other non-metallic materials. Repair and maintenance services rendered on machinery and industrial equipment are also covered by this regulation. However, automotive, construction, road maintenance and farm equipment repairs are not covered by this regulation.

Maximum prices for the services covered by this regulation, which are rendered in connection with the production of a commodity, were heretofore established by Maximum Price Regulation 136, as amended. Machines and Parts, and Machinery Services) and Revised Maximum Price Regulation 165 (Services). The determination of which of these regulations was applicable to the supply of a particular service was dependent upon the end use of the finished product. If it was a machine or part, as defined in Maximum Price Regulation 136, as amended, the service was to be priced under that regulation. Otherwise, the service was to be priced under Revised Maximum Price Regulation 165.

This method of determining the applicable regulation was confusing to service suppliers because it was not customary for them to distinguish between services supplied by them on the basis of the end use of the finished product. Also, in many cases, the service supplier was unaware of the end use to which the finished product would be put. Even after these problems were resolved, service suppliers found it difficult to apply two regulations, with different pricing methods, to their businesses.

The adoption of a single regulation for all industrial services should resolve these difficulties. Further, the language is simpler than Maximum Price Regulation 136, as amended, which covered the bulk of these services, and technical phraseology has been avoided wherever possible.

The repair and maintenance services covered by this regulation are, for the most part, supplied by the same persons who supply the other services covered by this regulation. Accordingly, those repair and maintenance services are covered by this regulation in order to avoid requiring persons subject to

this regulation to price under two regulations.

In order to further simplify pricing for service suppliers, provision has been made to permit them to price the sale of commodities under this regulation. This will be done only where the seller's principal business is the supplying of services subject to this regulation and he occasionally sells commodities made to a user's specifications.

## II. The Pricing Provisions of the Regulation

The maximum prices of industrial services are established by using March 31, 1942, as a base date for pricing purposes. The use of this date will result in maximum prices which are in line with the level of maximum prices which were established by the regulations to which these services were formerly subject. Maximum Price Regulation 136, as amended, had a March 31, 1942, base date for services and Revised Maximum Price Regulation 165 has a March, 1942 base period.

The maximum price for a service in which the supplier dealt on March 31, 1942, is the price at which he would have supplied the service on that date to a purchaser of the same class. Where the supplier had a published price list in effect on March 31, 1942, this price is determined by adjusting the price or rate stated in that price list to reflect the supplier's March 31, 1942, differentials between classes of purchasers. Where the supplier did not have a published price list in effect on March 31, 1942, the maximum price is the highest price or rate at which he sold a service which he supplied more than once during the period January 1 to March 31, 1942, inclusive, adjusted to reflect the supplier's March 31, 1942, differentials between classes of purchasers.

The foregoing provisions, it is believed, will cover most industrial services. In the case of services which cannot be priced in accordance with any of these methods, the supplier is to determine his maximum price by using the same method of computation and the same labor rates, or costs, material prices, machine hour or equipment rates, if any, and the overhead and profit rate, for services of the same type, which were in effect in his shop on March 31, 1942. If the supplier had no such pricing method in effect on March 31, 1942, or if he was not supplying services of the same type on that date, he must apply to the Office of Price Adminis-

tration for the approval of a pricing method or rate.

Provision is made in the regulation for individual price adjustments. This provision is in line with the stated adjustment policy of the Office of Price Administration.

## III. Conclusion

All provisions of this regulation and their effect upon business practices, cost practices or methods, or means or aids to distribution in the industry or industries affected have been carefully considered. No provisions which might have the effect of requiring a change in such practices, means, aids or methods established in the industry or industries affected, have been included in the regulation unless such provisions have been found necessary to achieve effective price control and to prevent circumvention or evasion of the regulation or of the Act. To the extent that the provisions of this regulation compel or may operate to compel changes in business practices, cost practices or methods, or means or aids to distribution established in the industry or industries affected, such provisions are necessary to prevent circumvention or evasion of this regulation or of the Emergency Price Control Act of 1942, as amended.

Before issuing their regulation, the Price Administrator has, so far as practicable, consulted with representative members of the industries which are affected by this regulation. Meetings were held with the Heat Treating, Hot-Dip Galvanizing, and Plating and Enameling Industry Advisory Committees at which a tentative draft of the regulation was submitted and discussed. In addition, meetings were held with service suppliers, not represented by these committees, in San Francisco, Los Angeles, New York and Cleveland, at which a tentative draft of the regulation was submitted and discussed. As a result of these meetings, a number of recommendations were received from the industry. Each recommendation received was given full consideration and most of these suggestions have been incorporated into the regulation.

In the judgment of the Price Administrator, the maximum prices established by this regulation are and will be generally fair and equitable and will effectuate the purposes of the Emergency Price Control Act of 1942, as amended.

Issued this 26th day of March, 1945.

CHESTER BOWLES,  
Administrator.



(Document No. 44748)

**Part 1499—Commodities and Services  
Section 1499.683****[MPR 581]****Industrial Services**

**I**N THE judgment of the Price Administrator, the maximum prices established by this regulation are and will be generally fair and equitable and will effectuate the purposes of the Emergency Price Control Act of 1942, as amended. A statement of the considerations involved in the issuance of this regulation has been issued simultaneously herewith and filed with the Division of the Federal Register.

**SECTION 1. Services covered—(a) In general.** This regulation covers the prices charged for the following services performed on material or products owned by another:

(1) All jobbing shop operations customarily performed in the fabrication of metals or metal products. These operations include abrading, adjusting, assembling, cutting, forming, grinding, machining, shaping and welding or otherwise joining. However, this regulation does not cover the forging of metals by the use of power-actuated hammers, pressing or forging machines. The forging of ferrous metals is covered by Maximum Price Regulation 351—Ferrous Forgings (MPR 351); while the forging of non-ferrous metals is covered by Revised Maximum Price Regulation 165—Services (RMPR 165).

(2) All jobbing shop operations customarily performed in the treatment, coating, or finishing of metals or metal products. These operations include annealing, anodizing, bonderizing, blasting, carbonizing, carburizing, case-hardening, cleaning, caronizing, deoxidizing, enameling, galvanizing, heat treating, heresiting, japanning, lacquering, lead coating, metallizing, nitriding, normalizing, painting, pickling, phosphate coating, plating, polishing, sherardizing, shot peening, tempering and tinning.

(3) Plating on plastics and other non-metallic materials.

**(b) Exclusions—**

(3) **Secret contracts.** This regulation does not apply to services sold by you under a contract or subcontract that is certified in writing to the OPA as being "secret" by any agency of the United States or any agency of a country whose defense the President deems vital to the defense of the United States under the terms of the Lend-Lease Act. This certification must set forth the date of the secret contract or subcontract and its number or other designation. The certifying government agency shall notify the seller and the OPA whenever such contract or subcontract ceases to be contract. This exemption shall not apply after you receive such notification from the certifying government agency.

(4) **Developmental contracts—(i) Exclusion.** This regulation does not apply to services sold by you under a contract or subcontract that is certified in writing to the

OPA as being "developmental" by any agency of the United States or any agency of a country whose defense the President deems vital to the defense of the United States under the terms of the Lend-Lease Act. A contract is "developmental" during the period required for you to obtain sufficient experience to permit a fair estimate of your shop costs. If the OPA determines, after consultation with you and the appropriate government agency, that the period necessary for development has expired, and in writing so notifies you and such agency, this regulation shall apply to all subsequent sales of the service.

(ii) **Report.** You shall file a report with the Machinery Branch, Office of Price Administration, Washington 25, D. C., within ten days after you enter into a developmental contract or subcontract. This report must set forth a description of the services under the contract, a summary of the terms of the contract, and an estimate of the length of time that the work will be developmental. If you were operating under a developmental contract on March 31, 1945 (the effective date of this regulation), this report must be filed before April 30, 1945. You need not file a report if the developmental contract or subcontract is also certified as "confidential" or "restricted" by the certifying government agency.

(c) **Applicability.** This regulation applies in the forty-eight states of the United States and in the District of Columbia, but not in the territories and possessions of the United States.

**SEC. 2. Prohibitions.** On and after March 31, 1945, regardless of any contract or other obligation:

(a) You may not sell any service covered by this regulation at a price higher than your maximum price.

(b) No person in the course of trade or business may buy any service covered by this regulation at a price higher than the maximum price.

(c) However, you may complete any contract entered into before March 31, 1945 (the effective date of this regulation), if the price stated in that contract was permissible under the price schedule or regulation which was applicable to the transaction at the time the contract was made.

Of course, you may charge lower prices than your maximum prices at any time.

**SEC. 3. Prices previously established.** This regulation supersedes Revised Maximum Price Regulation 165—Services (RMPR 165) and Maximum Price Regulation 136, as amended—Machines and Parts, and Machinery Services (MPR 136), in so far as services covered by this regulation are concerned. However, all prices approved in writing by the OPA under MPR 136 remain in effect under this regulation. See section 10 for filing requirements.

**SEC. 4. General pricing provisions.** In determining your maximum price, use the first of the following provisions which applies to you. Your maximum price shall be:

(a) **List price.** The price or rate for the same service stated in the published price list which you had in effect on March 31, 1942. This price or rate must be adjusted in order to reflect the price differential that you had in effect to a purchaser of the same class on March 31, 1942. Be sure to read the definition of "purchaser of the same class" in section 16 (e). See the next section 5 for additional charges that may be made under certain conditions.

(b) **Prices or rates charged January 1 to March 31, 1942.** The highest price or highest rate at which you sold a service which you performed more than once during the period January 1 to March 31, 1942 inclusive. This price or rate must be adjusted in order to reflect the price differential that you had in effect to a purchaser of the same class on March 31, 1942. Be sure to read the definition of "purchaser of the same class" in section 16 (e). See the next section 5 for additional charges that may be added under certain conditions.

(c) **Pricing method.** The price determined by the same method of computation and the same labor rates or costs, material prices, machine or equipment rates, if any, and overhead and profit rate, which were in effect in your shop on March 31, 1942, for determining the selling prices of services of the same type to a purchaser of the same class (as defined in section 16 (e)). When you take work of a new nature, you may quote a tentative price and determine your maximum price (in accordance with this paragraph) on the basis of your actual experience in a trial run. The maximum price so established shall apply to the entire contract, including the trial run.

You must keep records of the maximum prices determined under this paragraph for every job of \$100 or more, an estimate record for each such job showing the method by which you determined these maximum prices, and the services to which those maximum prices apply, for so long as the Emergency Price Control Act of 1942, as amended, remains in effect.

See the next section 5 for additional charges that may be added under certain conditions.

**SEC. 5. Additional charges—(a) Overtime and shift premium.** If on March 31, 1942, you had overtime or shift premium rates in effect to your customers, your maximum prices for overtime or shift premium work must be determined by using these rates. If you had no overtime or shift premium rates in effect on March 31, 1942, you must add the actual amount of premium paid to labor, or the estimated amount, if necessary, to the maximum price. The amount of this charge must be determined by using current labor rates. If you wish, you may prorate the overtime or shift premium paid by you over your standard work week. When you do not so prorate the overtime or shift premium charged by you, the extra charge for premium work must be stated separately on the invoice. In any case, the overtime

or shift premium charged by you for overtime or shift premium work in excess of such standard work week must be stated separately on the invoice.

(b) *Materials furnished incidental to the service.* Your maximum price for a service under this regulation includes any materials furnished incidental to the service. If on March 31, 1942, you made a separate charge for material furnished incidental to the service, you may continue this practice. This separate charge may not be greater than your cost for the material (not to exceed the applicable maximum price), plus the same markup you applied on March 31, 1942. If you did not furnish material incidental to the service on March 31, 1942, your charge for such material must be determined under section 6.

(c) *Other additional charges.* You may not make any charge for any incident of a service if it was not your practice to do so on March 31, 1942. You may not require a purchaser to pay a larger proportion of the transportation costs incurred in the supply of any service than you required a purchaser of the same class to pay on March 31, 1942, for the same or a similar type of service. If on March 31, 1942, you made a separate charge for packaging in connection with the supply of the same or a similar type of service, the amount of this separate charge shall be determined by using current costs (not to exceed the applicable maximum price) and the method of determining this charge that you used on March 31, 1942. See Supplementary Order 34 (Packing Expenses on Sales to War Agencies) for special packing expenses which you may add to your maximum price on deliveries to war procurement agencies. If you were not supplying services of the same type on March 31, 1942, your additional charges, if any, must be determined under section 6.

SEC. 6. *Services which cannot be priced under section 4.* (a) If you cannot determine a maximum price or rate under section 4, you must apply in writing to the OPA for approval of a rate or pricing method. This rate or method must result in maximum prices which are in line with maximum prices established by this regulation for shops in your area doing similar work. Also, this rate or method must be based on labor rates in effect in your area on March 31, 1942. A rate or pricing method approved under this section may apply to your entire business or to any portion of your business.

(b) If you did not sell any services during 1944, or if your sales of all services during 1944 amounted to less than \$75,000, the application required under this section must be filed with the appropriate OPA district office. Otherwise, the application must be filed with the Machinery Branch, Office of Price Administration, Washington 25, D. C. The application must contain a description of the type of service, the proposed rate or pricing method, and an example showing how prices are determined in accordance with this rate or method. It must also contain a full explanation of the reasons why you cannot price this type of service under section 4.

(c) In the case of a service for which ap-

proval of a rate or pricing method is requested under this section, you may not accept payment in excess of 75% of the price determined in accordance with your proposed rate or pricing method until it has been approved by the OPA, but the proposed rate or pricing method shall be considered approved thirty days after receipt by the OPA of the application (or any verification of the facts stated in the application which may have been requested), unless, within that time, OPA notifies you that your proposed rate or pricing method has been disapproved. Final settlement must be made in accordance with the action taken by the OPA on your proposed rate or pricing method, and where required refunds shall be made.

(d) OPA may at any time disapprove or revise a pricing method or rate established under this section so as to bring it into line with maximum prices established by this regulation in your area.

(e) When you take work of a new nature, you may quote a tentative price and determine your maximum price on the basis of your actual experience in a trial run. The maximum price so established shall apply to the entire contract, including the trial run. Of course, in determining maximum prices under this paragraph, you must comply with the other provisions of this section.

(f) You must keep records of the maximum prices determined under this section for every job of \$100 or more, an estimate record for each such job showing the method by which you determined those maximum prices, and the services to which those maximum prices apply, for so long as the Emergency Price Control Act of 1942, as amended, remains in effect.

SEC. 7. *Transfer of business.* If you acquire the business, assets or stock in trade of any business after March 31, 1942, and you carry on the business, or continue to supply the same type of services, in an establishment separate from any other establishment previously owned or operated by you, your maximum rates or prices shall be the same as those to which your transferor would have been subject if no such transfer had taken place, and your obligation to keep records sufficient to verify such rates or prices shall be the same. You must further prepare and file, (if your transferor has not already done so) and keep up to date, the statement required under section 10. Your transferor shall preserve and turn over to you all records of transactions prior to the transfer which are necessary to enable you to comply with the provisions of this regulation.

SEC. 8. *Taxes.* If a tax or tax increase is imposed on a service covered by this regulation, and the tax law does not forbid you to pass the tax on to your customers, you may add the tax or tax increase to your maximum price, if you separately state it. However, if the tax was in effect on March 31, 1942, and it was not your custom to charge extra for the tax on that date, you may not do so now.

SEC. 9. *Invoices.* You must give the purchaser an invoice stating your name and address, the name and address of the purchaser, the service rendered, the price

charged and any statements of separate charges otherwise required by this regulation. This invoice must also contain the following statement: "Prices in this invoice are not higher than the maximum established by Maximum Price Regulation 581 (Industrial Services)". You must keep a copy of each such invoice for examination by the OPA, for so long as the Emergency Price Control Act of 1942, as amended, remains in effect.

SEC. 10. *Records; filings of statements.* You must comply with the following provisions for keeping price records and for filing statements of your maximum prices:

(a) *Records.* Preserve for examination by the OPA, for so long as the Emergency Price Control Act of 1942, as amended, remains in effect, all records regarding your prices, rates or pricing methods for services supplied or offered for supply by you during the period January 1 to March 31, 1942, inclusive, which you had in your possession on the effective date of this regulation.

(b) *Filing of statements.* (1) Prepare and keep for examination by the OPA, a statement of your maximum list prices or rates and pricing methods for purchasers of each class, together with an adequate description of each service to which they apply. If any of those prices, rates, or pricing methods are different from those you had in effect on March 31, 1942, the statement must contain an explanation of such differences. If your maximum prices are based upon a flat rate manual or similar pricing manual or parts catalog or list, you may (instead of appending it to the statement) clearly identify on the statement such manual, parts catalog or list by name, edition, number and date, indicating the instances in which it was not your practice on March 31, 1942, to follow it.

(2) If your sales of all services during 1944 were less than \$75,000, file a duplicate of your statement with the appropriate OPA district office. If your sales of all services during 1944 were \$75,000, or more, file a duplicate of your statement with the Machinery Branch, Office of Price Administration, Washington 25, D. C., as well as with the appropriate OPA district Office. This statement shall be filed before April 30, 1945.

(3) You must prepare and file a supplement to the statement within thirty days of the date that your maximum price for a new kind of service is first established by this regulation. You must also prepare and file an appropriate supplement to the statement within ten days after any change in your maximum price is authorized by the OPA. These statements must be filed in accordance with (2) above.

(4) The statement and all supplements thereto must be signed by you or your authorized agent.

(5) If you can show that the foregoing requirements subject you to unusual hardship, you may apply to the Machinery Branch, Office of Price Administration, Washington 25, D. C., for written authorization to depart from these requirements. Such authorization will be given only if it will not be inconsistent with the purposes of this regulation.

SEC. 11. *Violation*—(a) *License suspension*. The provisions of Licensing Order No. 1, licensing all persons who make sales under price control, apply to you. Your license may be suspended for violations of the license or of any price regulations applicable to licensed sales. If your license is suspended, you may not, during the period of suspension make any sale for which your license has been suspended.

(b) *Civil and criminal action*. If you violate any provisions of this regulation, you are subject to the criminal penalties, civil enforcement actions, license suspension proceedings, and suits for treble damages provided by the Emergency Price Control Act of 1942, as amended.

(c) *Record-keeping and filing violations; failure to establish maximum price*. If you fail to keep the record or file the statements as required by sections 4 (c), 6 or 10, or if you fail to establish a maximum price under section 6, if you are required to do so, OPA may issue an order establishing maximum prices for the services you sell in line with prices established by this regulation. The maximum prices so established may apply to all or some of the services supplied by you after March 31, 1945. This will not relieve you of your obligation to comply with the requirements of sections 4 (c), 6 or 10, or of the various penalties for any failure to do so.

SEC. 12. *Adjustments*—(a) *Adjustment based on hardship*. The OPA may adjust any maximum price established under this regulation upon a demonstration of substantial financial hardship threatening your ability to continue to supply a service, subject to the following limitations:

(1) No adjustment will increase your maximum prices above the levels which the OPA considers necessary to permit you to continue the sale of your services. In judging whether a maximum price will prevent you from continuing to sell a service, the OPA will take into account such pertinent factors as the nature of your business, your current costs of supplying the service and the over-all earnings of your business.

(2) No adjustment will increase your maximum prices above the prices at which your customers are able to obtain the same or a fairly equivalent service from other suppliers.

However, if, in the judgment of OPA, the loss of your services would be detrimental to the effective prosecution of the war, or would impair the maintenance of an adequate wartime standard of living, the OPA may apply only the first of the above limitations.

(b) *Adjustment based on a decrease of other prices*. The OPA may adjust any maximum price established under this regulation if you agree to make and (simultaneously with any increase in your maximum price that may be authorized under this paragraph (b)) actually do make a reduction in your selling prices which will equal or exceed the total dollar amount of the adjustment granted you under this paragraph. An adjustment will not be granted you under this paragraph, if your increases in price are to be made to civilian pur-

chasers and your decreases in price are to be made to governmental purchasers.

An application for price adjustment under this paragraph (b) must show that your sales of the services affected by the adjustment will not be greater than it would have been in the absence of the adjustment. Whenever the OPA grants such an adjustment, it may require appropriate reports relating to the services affected.

(c) *Procedure*. An application for adjustment under paragraph (a) must be made on a copy of Form OPA 694-2169, set out in Appendix A. All applications for adjustment must be filed in accordance with Revised Procedural Regulation No. 1.

If your sales of all services during the previous years were less than \$75,000, you must file your application with the appropriate OPA district office. Otherwise, file your application with the Office of Price Administration, Washington 25, D. C. Supplementary Order 28 sets forth additional rules which must be followed when your application is based on a pending wage or salary increase requiring approval of the National War Labor Board.

(d) *Price for deliveries pending disposition of the application*. After you have filed an application under this section 12, you may contract or agree that deliveries made during the pendency of the application shall be at the price requested in your application. However, you may not receive payment in excess of the maximum price until your application is finally disposed of, and at that time the price received may not exceed the maximum price as determined by the OPA.

If you wish to enter into such an arrangement, you must state the following to the buyer:

- (1) The maximum price for the service;
- (2) The fact that an appropriate application for an adjustment of the maximum price has been filed with the OPA; and
- (3) The fact that the specific price quoted by you is subject to approval by the OPA.

SEC. 13. *Petitions for amendment*. If you seek a change in any provision of this regulation affecting sellers of a service generally, you may file a petition for amendment in accordance with Revised Procedural Regulation No. 1.

SEC. 14. *Adjustable pricing*. You may agree to sell at a price which can be increased up to the maximum price in effect at the time of delivery. However, except as provided in section 12 (Adjustments) you may not, unless authorized by the OPA, deliver or agree to deliver at prices to be adjusted upward in accordance with action taken by the OPA after delivery. Such authorization may be given when a request for a change in the applicable maximum price is pending, but only if the authorization is necessary to promote distribution or production and if it will not interfere with the purposes of the Emergency Price Control Act of 1942, as amended. The authorization may be given by the Administrator or by any official of the OPA having authority to act upon the pending request for a change in price or to give the authorization. The authorization will be given by order.

SEC. 15. *Pricing your sales of commodities under this regulation*. If your principal business is the supplying of services subject to this regulation and you occasionally sell commodities (where you supply all the materials and furnish the services) made to a user's specifications, OPA may, by order, require you to price such sales under this regulation. Such an order will supersede the provisions of the applicable commodity regulation.

If you wish OPA to issue such an order, apply to the appropriate OPA district office if your sales of all services during 1942 were less than \$75,000, and to the Machinery Branch, Office of Price Administration, Washington 25, D. C., if your sales of all services during 1944 were \$75,000 or more.

SEC. 16. *Evasion*. This regulation shall not be evaded directly or indirectly by any reduction of your customary allowances, discounts or other price differentials, or by tying agreements, or by deterioration of services, or otherwise.

SEC. 17. *Definitions and explanations*. When used in this regulation:

(a) "Appropriate OPA district office" means the district office of the Office of Price Administration for the district where your place of business is located.

(b) "OPA" means the Office of Price Administration.

(c) "Person" includes an individual, corporation, partnership, association, or any other organized group of persons, or the legal successor or representative of any of the foregoing, and the United States or any other government, and the political subdivisions and agencies of any of the foregoing.

(d) "Pricing method" is a method of determining a price for a service by relation to its actual or estimated costs.

(e) "Purchaser of the same class" means a purchaser belonging to the same price class, that is, a group of purchasers to whom it was your established practice during the period January 1, to March 31, 1942, inclusive, to supply the same service at a particular price. If, during that period, you customarily supplied or offered to supply the same service to any purchaser at a price different from the price or prices at which you supplied or offered to supply the same service to all other purchasers, that purchaser is in a purchaser price class by himself.

If during the period January 1, to March 31, 1942, inclusive, you had an established practice of charging the same price to certain customers on the basis of standards (such as, the nature of the buyer—manufacturer, wholesaler, retailer, etc., or the nature of the sale—large, small, cash, credit, etc.), you must place a new purchaser of the same service in the proper purchaser price class in accordance with such standards. If you had no such standards, you must establish a price for the new purchaser under section 6 of this regulation. For the purposes of this definition, a "new purchaser" means a purchaser to whom you did not supply or offer to supply the same type of service during the period January 1, to March 31, 1942, inclusive.



(f) "Rate" is a fixed charge per unit of time, weight, or price.

(g) "Records" include books of account, sales lists, sales slips, orders, vouchers, contracts, receipts, invoices, bills of lading, and any other papers and documents relating to your prices.

(h) "Sell" includes sell, supply, dispose, barter, exchange, transfer, deliver, and contracts and offers to do any of the foregoing. The terms "sale", "selling", "sold", "seller", "buy", and "purchase", shall be construed accordingly.

(i) "You" refers to any seller subject to this regulation. If you supply services through more than one place of business, each such place of business shall, for the purpose of this regulation, be considered a separate seller.

SEC. 18. *Delegation of authority.* The Price Administrator, any Regional Administrator and any District Director who has been authorized to act by the Regional Administrator having jurisdiction over his district, may establish, approve, correct or adjust maximum prices under sections 4, 6, 11, 12 and 15 of this regulation.

#### Appendix A: Form for Applications for Adjustment

Form OPA 694--2169

Approval waived by the Budget Bureau  
United States of America  
Office of Price Administration  
Washington, D. C.

Application for adjustment of Maximum Prices for Industrial Services Under Maximum Price Regulation 581.

Company Name \_\_\_\_\_  
Address \_\_\_\_\_  
(Street) (City) (State)

The following facts are furnished to the Office of Price Administration in support of this application:

1. General description of company's business.
2. Type of service for which price increase is requested.

3. Describe war or civilian need of the service.
4. Explain on a separate sheet why you are making a request for a price increase.
5. State the names and addresses of competitors in your region rendering the same services and state the prices or rates charged by each.
6. File the following information for the service described in Item 2 above.
  - (a) Price or rate March 31, 1942 \$ \_\_\_\_\_  
Present price or rate \$ \_\_\_\_\_  
Requested price or rate \$ \_\_\_\_\_  
per \_\_\_\_\_  
Service unit (machine hour, man hour, etc.) \_\_\_\_\_
  - (b)  
Total number of service units billed:  
Year ended \_\_\_\_\_ 194 \_\_\_\_\_  
Year ended \_\_\_\_\_ 194 \_\_\_\_\_  
months ending \_\_\_\_\_ 194 \_\_\_\_\_  
Corresponding dollar amount of service billings (net):  
Year ended \_\_\_\_\_ 194 \_\_\_\_\_  
Year ended \_\_\_\_\_ 194 \_\_\_\_\_  
months ending \_\_\_\_\_ 194 \_\_\_\_\_

NOTE: This information as to sales of the service, for which you are requesting a price increase, must be submitted for the last two years and for the most recent accounting period in the current year.

	Ceiling date March 31, 1942	Current date (month) 194...	Basis of allocation (specify below)
Direct labor.....	.....	.....	xxx
Shop overhead.....	.....	.....	.....
Administrative expense.....	.....	.....	.....
Selling expense.....	.....	.....	.....
Other expense (specify).....	.....	.....	.....
Total cost per service unit.....	.....	.....	xxx
Average hourly wage rate, exclusive of overtime, for direct labor engaged in this service.....	.....	.....	xxx
Average number of hours worked per man per week (direct labor only).....	.....	.....	xxx

Important: if you have submitted any of the following information on Office of Price

Administration Financial Report Forms A and B for certain periods or have reported the same on a previous application for adjustment of a maximum price, you may omit these periods in your present report. In the case of a subsidiary wholly owned by a parent corporation, the financial data should be submitted for the parent corporation.

8. Submit balance sheets and profit and loss statements for the past three years and for the most recent accounting period in the current year. NOTE: Each profit and loss statement must contain a detailed breakdown of cost of goods sold, administrative expenses, selling expenses, and officers' salaries including the number of officers.

9. Submit balance sheets and profit and loss statements on OPA Form A, Annual Financial Report, or your own prepared statements for the years 1936-1940. The filing of these data is optional, provided reports are available from the Bureau of Internal Revenue. Should the applicant prefer, this information will be requested by the Office of Price Administration directly from the Bureau of Internal Revenue.

10. Are the salaries and wages of all your employees in compliance with the maximum established by the Office of Economic Stabilization? \_\_\_\_\_

Yes or No

If "No", state exceptions: \_\_\_\_\_

(Applicant)

By \_\_\_\_\_

(Title)

I certify that the facts contained in the above application are true and correct.

(Signature)

Effective date: This regulation shall become effective March 31, 1945.

NOTE: All record keeping and reporting requirements of this regulation have been approved by the Bureau of the Budget in accordance with the Federal Reports Act of 1942.

Issued this 26th day of March 1945.

CHESTER BOWLES,  
Administrator.

## THE DEPOSITION OF METALS FROM FLUOBORATE SOLUTIONS

(Continued from page 190)

1 quart of hot water while stirring rapidly and constantly. A uniform creamy mix is obtained. This mixture is then poured with rapid, continual stirring into the plating bath and then the latter stirred thoroughly.

The tin fluoborate bath is best operated at 75°-100° F. at current densities between 25-50 amperes per square foot using an anode to cathode ratio of 2 to 1. Current densities between 50-75 amperes per square foot may be used with proper mechanical agitation using a stirrer or moving cathode rod arrangement.

The anode material should be pure tin and the equipment constructed of rubber, Bakelite, glass, bituminous-painted wood or similar materials.

A simple procedure for determining the tin metal content in the tin fluoborate bath is as follows:

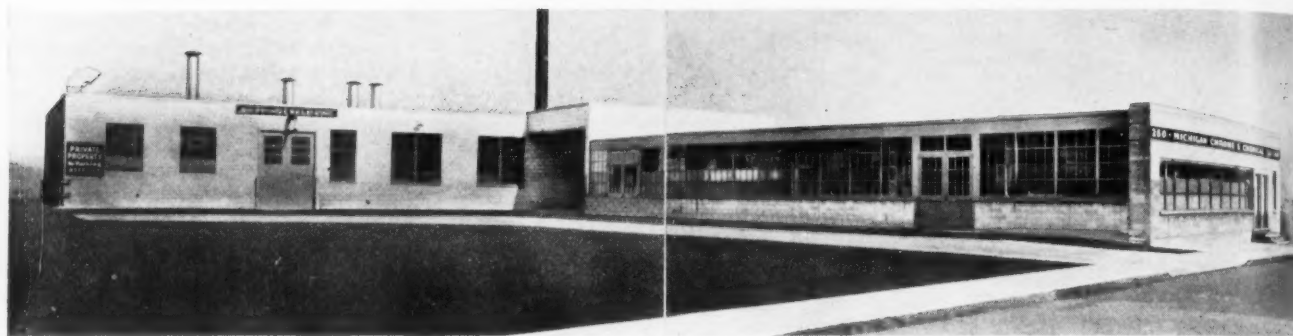
1. Pipette a 10 cc. sample of the plating solution and dilute it to 100 cc. in an Erlenmeyer flask; add 50 cc. of a 0.2N ferric chloride solution. This latter solution is prepared by dissolving 55 g/L. of  $\text{FeCl}_2 \cdot 6 \text{H}_2\text{O}$  and adding approximately 5-10 cc. /L. of concentrated HCl.
2. Titrate the above solution with 0.2N potassium permanganate to a pink coloration which remains permanent for at least one minute.
3. A blank should be run on the potassium permanganate; that is, the amount of potassium permanganate solution re-

quired to produce the same pink coloration in 50 cc. of the ferric chloride solution similarly diluted.

4. Subtracting the value in (3) from that in (2) gives the cc. of permanganate used. This value multiplied by 0.158 equals the oz. per gallon of tin in the fluoborate solution or multiplied by 1.19 gives the grams per liter of tin in solution.

The free and total fluoboric acid may also be determined by chemical analysis as previously discussed in the section dealing with the control of the lead fluoborate solution. Likewise the Hull cell is employed to determine the most suitable addition agent content.

(To be concluded in June)



Modern finishing plant of Michigan Chrome & Chemical Co.

## Laboratory Control of Plating Operations

### Improves Quality, Reduces Rejects

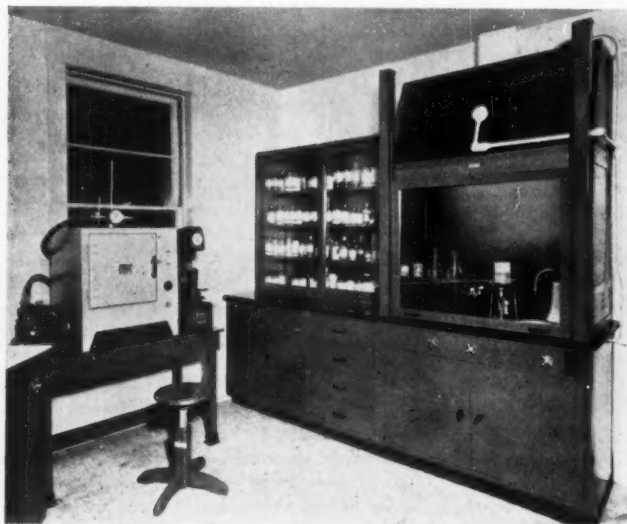
**L**ABORATORY control of plating operations is a necessity in keeping quality up to the very high standard demanded by all war contracts. Michigan Chrome and Chemical Company operates a complete plating plant including bright chromium, hard chromium, copper (rochelle and high speed), cadmium, tin, silver, nickel, bronze and other metals.

Prior to Lend-Lease, when the tempo of production was slower, control of plating operations was proportionately easier, although by no means of less value in quality control. However, since Lend-Lease and the increased demand of the war effort it has been found that if quality is to keep pace with production, and in some instances is to go ahead at all, precise methods of control are necessary at all hours of the day. To meet the ever present production control problems and to satisfy the restrictions and testing procedures set forth in the many plating specifications, Michigan Chrome and Chemical Company has vastly expanded and modernized their laboratory facilities.

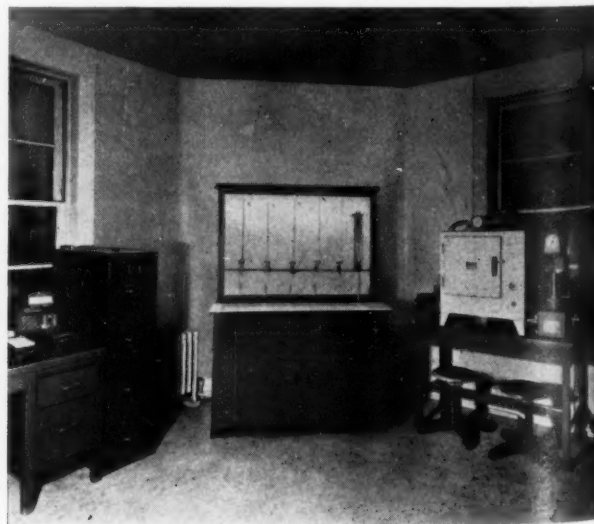
This laboratory has proved to be one of the most profitable installations in the plant. Quality has been improved, rejected parts due to improper bath conditions and other controllable factors have been

nearly eliminated, and plant efficiency has been stepped up. In addition to applying laboratory control to their own operations, Michigan Chrome and Chemical Company has done similar work for other platers who do not have these facilities and has carried on research on special problems for others.

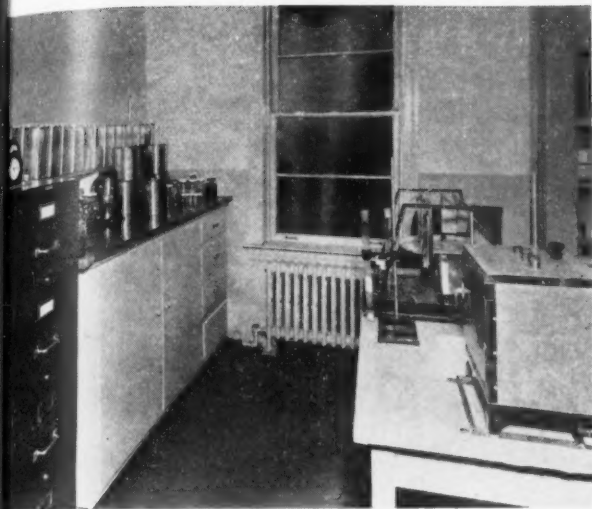
The Michigan Chrome and Chemical Company laboratory contains equipment of the newest types for the testing of plating solutions and plated parts, as well as a section, with its own darkroom, devoted to metallographic work. Some of the more useful tests performed on plating solutions include electro-analysis, pH determination, surface tension measurements and the Hull Cell test for bright plating range. Various instruments such as magnetic thickness gage, dropping test apparatus and microscope are used to determine the thickness and other characteristics of deposits. Salt spray tests are conducted in accordance with Army and Navy specifications. The metallographic laboratory provides an accurate, permanent record of the structure of any material, since it is equipped to take photomicrographs of the plate or basis metal at magnifications from twenty-five to two thousand diameters. All of these various tests, when properly used and the results properly tabulated, enable the plater to maintain closer quality control over his production and to avoid costly mistakes.



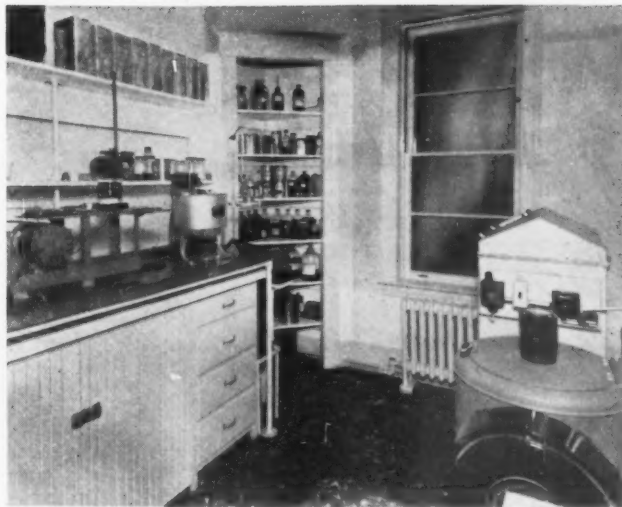
View of analytical laboratory.



Another view of analytical laboratory. Rockwell hardness tester at extreme right.



View of department in which organic coating and stopping-off materials are tested.



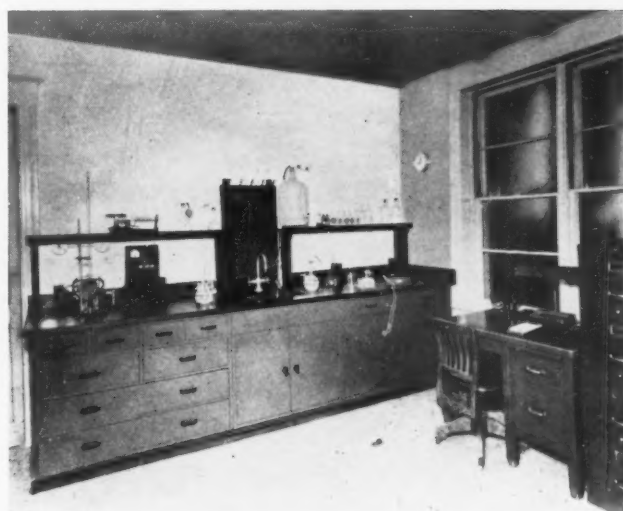
Organic coatings section of laboratory. Salt spray chamber at right.



Metallographic laboratory. Metallographic polishing equipment includes three discs, shown mounted in bench at left of photograph. Photomicrographic apparatus at right.



View of library.



Chemical analysis section of laboratory.



# Plating with Up-to-Date Facilities at Adel

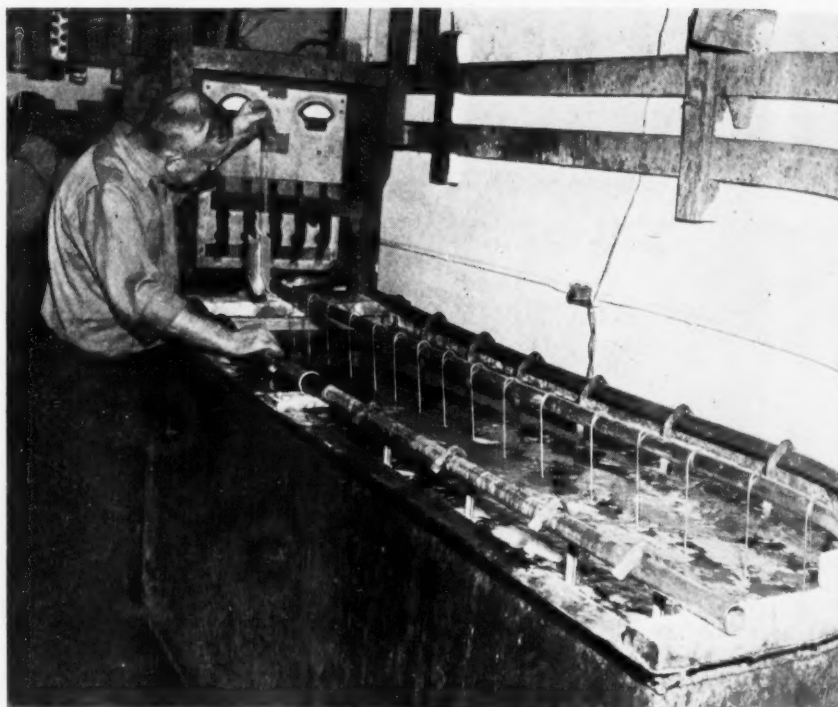
By GERALD ELDRIDGE STEDMAN

**A**MONG the 187 plants visited on my 1944 writing trek, covering 8000 miles west of the Mississippi, few were found that could equal the quality control in machining, processing or plating that I found at the Burbank, California plant of Adel Precision Products Corp.

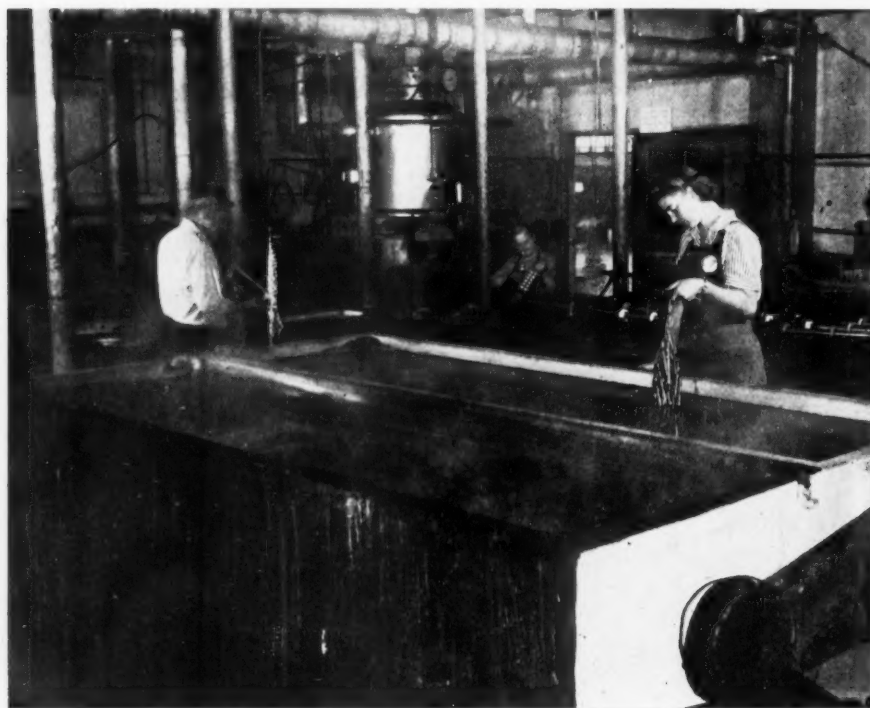
This concern is an important manufacturer of hydraulic, mechanical and electronic equipment. Its critical products appear on almost all United Nations military aircraft, and it is supplier to all American airlines.

Adel has had a striking growth since 1939; from 1200 to 200,000 sq. ft. in floor area; 22 to 2800 in employees; \$400 to \$2,000,000 in monthly volume. Its president, H. Ray Ellinwood, widely respected West Coast industrial leader, is an unusually able engineer and shop man.

The company has the advantage of complete newness in facilities, equipment and method. It works in corrosion resistant, carbon and low alloy steels, aluminum, brasses and bronzes, Ni-resist irons, Inconel, Alnico, Manganin, Nichrome, beryllium copper and Monel, in a complexity of bars and shapes, extrusions, sheets, tubing, castings.



Cadmium plating tank shown under working load.



Rinse tanks, showing copper plated shafts.

The enemy of hydraulic operation is, of course, line leakage and not only does fabrication have to be unusually accurate (0.0001" is a not uncommon limit) but all seating and sealing has to be nothing short of particular perfection. Because of this, the Adel plating technique is unusually meticulous. It is accomplished under extraordinary conditions of quality control, and with the very latest method and equipment. This article is based upon an interview with Edward Wildes, metallurgical supervisor, and Arlie Morgan, supervisor of plating, both very able technicians.

Anodizing by a protective chromic acid bath is the process used exclusively on aluminum to establish corrosion resistance and for proper paint adhesion. The parts to be anodized are racked in most cases from opposite corners on specially designed multiple racks which are constructed entirely of aluminum.

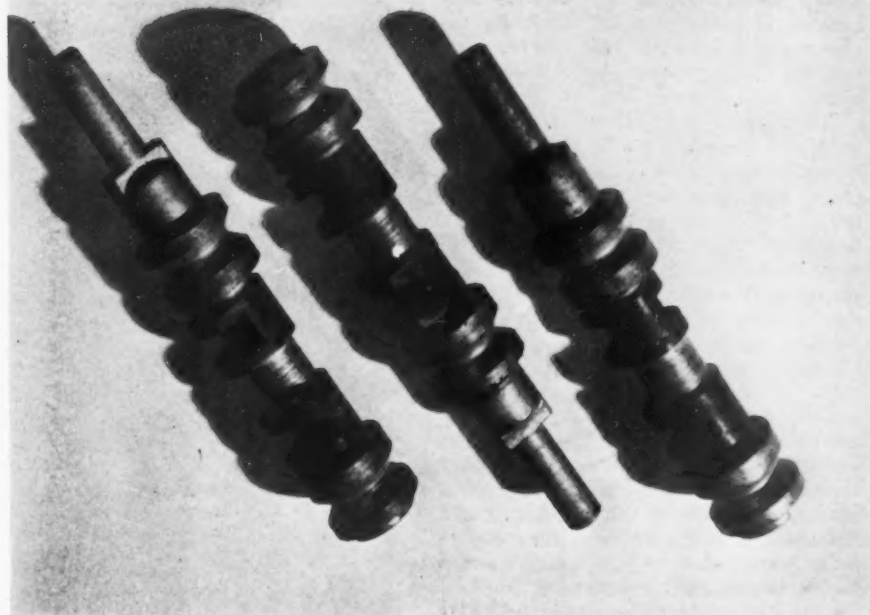
The treating tanks are lined up in series, with one aisle between the first rinse tank and the anodizing tank proper. This facilitates handling individual racks while in the chromic acid bath. Material handling has been very carefully engineered throughout the plating department.

The first tank in the anodizing sequence contains a mild alkaline cleaner for aluminum, temperature being held at 180°F. and within the close limits of  $\pm 2^\circ$ . The second tank is a hot rinse at the same controlled temperature. The anodizing tank is steel, lined with wire-reinforced glass. This affords protection against short circuits between the tank and work.

The anodic solution contains 5 to 10 per cent chromic acid by weight, dissolved in distilled water. It is maintained within this concentration range through the use of a glass electrode pH meter. Chromic acid is added periodically until such time as the aluminum content of the solution has reached a high concentration. Then the solution is dumped and renewed; the life of the solution ranges from 8 months to one year and represents no considerable overall cost.

The temperature of the anodizing solution is automatically controlled at 95°F.  $\pm 2^\circ$ . This necessitates electronic valve operation on each of the heating and cooling coils. A glance at the sheet on the temperature recorder signals any undue temperature rise. Good air agitation is maintained on the work while in the tank. Voltage is built up to 35 volts in 5 minutes and held for 30 minutes. At the end of this cycle, the work is lifted out and rinsed through a cold water tank. This is followed directly by a hot rinse which completely removes the chromic acid. This completes the series of five tank treatments involved in the anodizing process.

Directly over the anodizing tank series, in line, a crane and hoist service permits raising and lowering load through the complete dipping cycle. After final rinse, parts are unracked and dried by their storage on a flat steam coil. The interval here varies to accommodate the flow of work. Parts, after drying, are ready for subsequent operations.



Copper plated shafts showing light area of shafts masked off with copper, dark area showing unmasked portion of part to be carburized or case hardened.

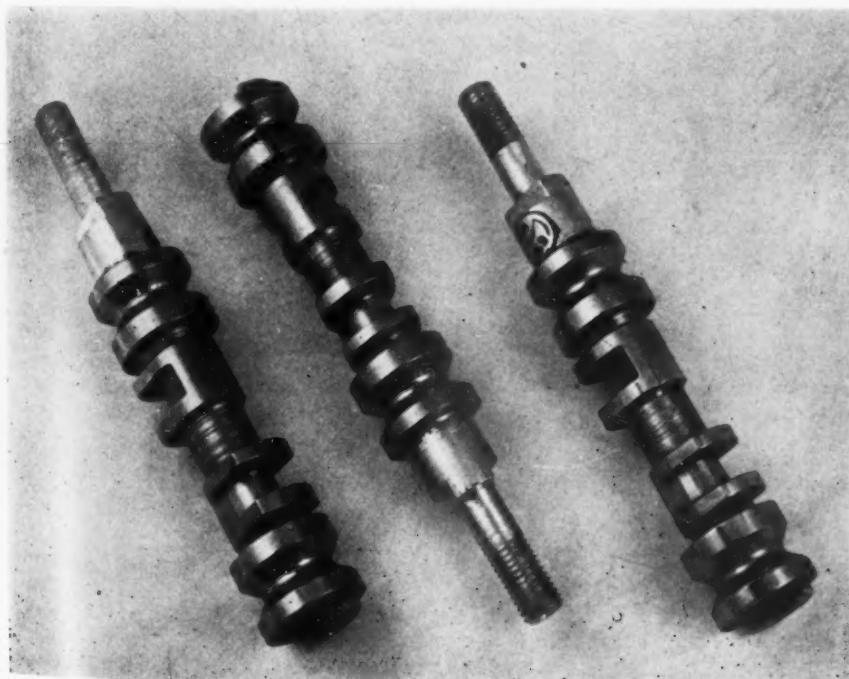
Adel makes extensive use of cadmium plating. Small parts to be plated are placed in a basket, degreased and pickled in an inhibited muriatic acid bath for the removal of scale. In masking for selective cadmium plating, racks are used that are so designed as to allow only that portion of the part to be plated to be exposed to the flow of the current. If the consideration involves caps or threaded fittings, a four sided rectangular rack is employed, drilled and tapped to the desired thread depth. Cylindrical parts to be plated on the o. d. are racked on a perpendicular series of brass-tubed sections; the cylinder being slipped over each tube in such manner

as to expose the o.d. only. Another method of masking is used that submerges only that portion to be plated below the surface of the plating solution. This fixture is designed for accurate placement and to be free from vibration. After properly wiring and racking, parts are again cleaned in an alkaline cleaning bath. The interval is from 2 to 4 minutes, current on. Parts are then dipped in cold and hot water, after which they receive a 5 per cent muriatic acid dip to neutralize the alkali and to activate the surface of the steel. This is followed by another cold rinse. Then the parts are ready for the plating bath.

A standard cadmium plating solution is employed, containing  $3\frac{1}{2}$  oz./gal. cadmium oxide,  $14\frac{1}{2}$  oz./gal. sodium cyanide and a proprietary brightener. The anodes are cadmium balls, suspended in steel spiral coil containers. The work to be plated is suspended from horizontal brass rods. Current density varies from 15 to 45 amps./sq. ft., depending upon the concentration of solution and temperature involved. The plating cycle varies from 5 to 15 minutes depending upon thickness required, load size and current density. A minimum of 0.0002" is maintained on threaded fittings.

When plating is completed, parts are rinsed in cold water again and then dipped in a dilute solution of nitric acid (one pint  $\text{HNO}_3$  to 20 gallons of water). Parts are then rinsed in a second cold water tank. "It is recommended," Mr. Morgan remarked, "that separate rinse tanks be consistently maintained for acid and alkaline solutions. Where steel parts are partially cadmium plated, the parts are dipped in a hot (150°F.) soluble oil solution to prevent any oxidation. If parts are to be sent to a customer stores, or if they are to be shipped as spare parts requiring a heavier rust preventative, a proprietary product is employed."

The principal Adel purpose in copper plating is for masking areas to prevent



Completed shafts with copper stripped and handle end cadmium plated.

carbon penetration in the selective carburizing of parts. Another use is for the prevention of scaling in heat treating parts that are already finishing machined, necessitating scale free surfaces.

The areas on such parts that are not to be plated are masked with water resisting masking tape. Then they are strung on copper wire preparatory to plating. A high speed cyanide copper solution is used in this plant. Current density ranges from 10 to 60 amp./sq. ft., depending upon concentration of solution; that is, providing constant temperature is maintained. The temperature employed is 70-80°C. This is manually controlled by a series of steam coils.

Sheet electrolytic anodes (9"x24") are suspended in each side of the bath. The parts to be plated act as cathode. They are suspended from horizontal brass rods, geared to a motor so that a swinging and agitated motion is maintained. An anode to cathode ratio of 2 to 1 is used. Average plating time is 0.001" per hour. The Adel standard for carburized parts is 0.0015"—0.002". Finished parts to be plated for protection against oxidation in heat treatment are generally flash copper plated. The plating time is 30 minutes.

Copper plated parts that have been sub-



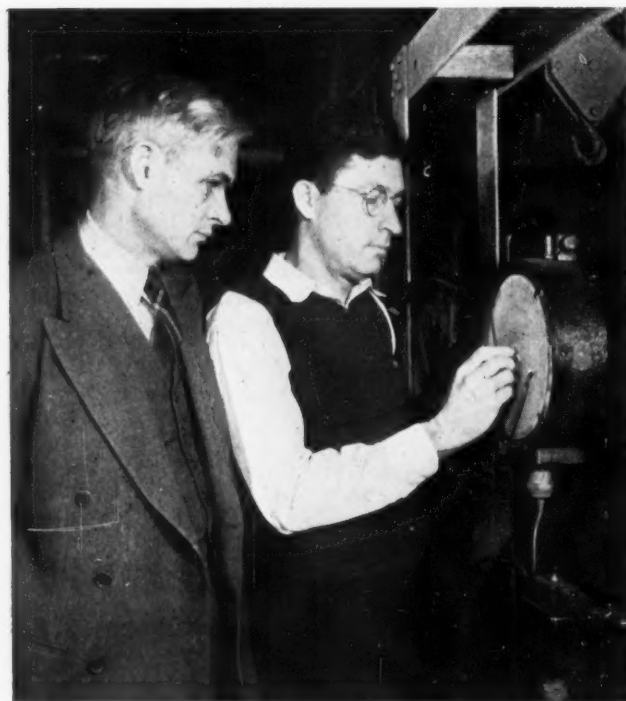
Multiple rack for cadmium plating.

sequently heat treated or selectively carburized are stripped by immersion in solution consisting of 4 lbs./gal. chromic acid and 7 oz./gal. sulfuric acid. A film of 0.001" dissolves in 20 minutes. After the removal of the copper plating, parts are immersed in both cold and hot water rinses to remove all traces of the stripping solution.

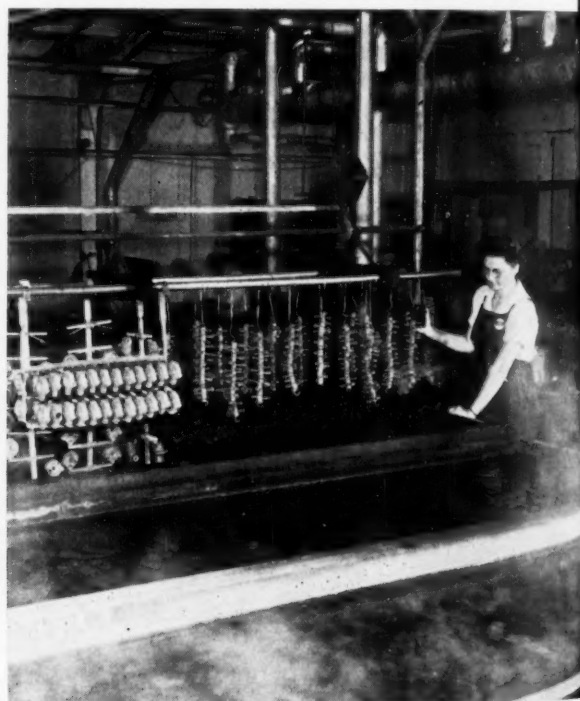
Adel uses some tin plating, its primary application being to build up threads on parts to insure perfect sealing in assembly operations. No masking is used in these plating operations, although some tin plating may be used in masking for selective nitriding.

The tin plating bath has this formula: 16 oz./gal. sodium stannate, 1 oz./gal. sodium hydroxide, 2 oz./gal. sodium acetate, 1/16 oz./gal. 100 vol. hydrogen peroxide.

Parts to be plated are suspended in the bath on horizontal brass bars. Current density is 6 to 60 amp./sq. ft., depending upon the bath concentration. Temperature maintained is 60-80°C., manually controlled. Pure Straits tin anodes are essential. Average plating thickness per hour is 0.0005" maximum. Tin plating requirements at Adel are 0.003". After plating, parts are rinsed in cold water and are ready for subsequent routing.



Wildes and Morgan talking by the temperature recorder for anodizing tanks.



Over-all view of the plating department, showing anodizing racks.



# THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING's Washington Correspondent



## Huston Gives Brenner Competition

The April meeting of the Baltimore-Washington Branch of the A. E. S., which was held in Teddy Reichhart's Restaurant in Baltimore, was attended by over 60 members and guests. Maurice Caplan is still the holder of the Branch prize money because the April attendance did not exceed the number present at the January meeting. President Ken Huston did his best to boost the attendance. To give Abner Brenner a little competition, Ken brought as his guests six young ladies from Western Electric's Baltimore chemical laboratory. Huston, who is also a promoter of efficient business methods, appointed a committee for the purpose of having it submit at the next meeting of the Branch a budget upon which the Branch should be operated on next year. The educational session of the meeting was a great success for Myron B. Diggin, Chief Chemist of Hanson-Van Winkle-Munning Company, with the aid of slides and specimens of workmanship, delivered himself of an interesting address on "Bright Alloy Plating."

## Diggin Talks on Bright Alloy Plating

In addressing the Branch on "Bright Alloy Plating" he divided his talk into four parts, namely: (1) deposit characteristics; (2) solution characteristics; (3) operating conditions, and (4) bright alloy plating applications. The slides consisted of curves showing the range of deposits according to copper, tin, zinc, sodium carbonate, sodium hydroxide, and free sodium cyanide in ounces per gallon. Under the head of bright alloy plating deposit characteristics he said (a) that it is silvery white in color; (b) that deposits come from the solution bright; (c) that it has a high tarnish resistance which is superior to nickel; (d) that it has excellent corrosion protective properties; (e) that it is hard and possessed of better abrasive resistance properties than nickel; (f) that it has low contact resistance; (g) that it has high throwing power; (h) that it deposits easily on most metals; (i) that it is non-magnetic; (j) that its hardness is not brittle when deposited as recommended; (k) that it increases solderability because of its non-corrosive ability, and (l) that it is not recommended for steel except for novelties. In speaking of solution characteristics he remarked (1) that it has low metal concentrations; (2) that it has excellent throwing power; (3) that it will not cover dirt; (4) that it can be successfully used in still, barrel and basket plating, and (5) that the bath should be controlled by analysis. Bright alloy plating, he warned, is operated on the voltage basis rather than on the current density basis. The cathode efficiency he said was about 35 per cent as compared with 100 per cent efficiency of anodes. Anodes, he pointed out, should be removed from the solution if they are not used for several days. He was somewhat cautious in speaking about the application of bright alloy plating. However, he did mention that it is, and could be, used on refrigerator evaporator units, jewelry, hardware and plumbing fixtures, screws and eyelets. The cost of bright alloy plating, he concluded, was comparable to nickel plating.

## Stricklen Now in the Navy

Ray Stricklen, Jr., secretary and treasurer of the Baltimore-Washington Branch of the A. E. S., was inducted into the Navy on March 28, 1945. Ray is now a member of Company 448 at the United States Naval Training Center, Great Lakes, Illinois. The members of the Branch expressed their appreciation of his efforts as secretary and treasurer; and they sent to him their best wishes.

## Taylor New Secretary and Treasurer of the Baltimore-Washington Branch

Al Taylor, Chief Metallurgical Chemist of the Research Division of Rheem Research Products of Baltimore, who was chairman of the April meeting of the Baltimore-Washington Branch of the A. E. S. was appointed secretary and treasurer of the Branch for the balance of Ray Stricklen's term of office.

## Reconversion Program Announced By WPB.

Chairman J. A. Krug of the War Production Board announced on April 3, 1945, that with victory in Europe the Board was prepared to free the nation's economy from wartime controls with its reconversion program. This WPB reconversion program provides for (1) equitable cutbacks; (2) positive assistance through controlled materials allotments and preference ratings for new or additional production for civilian uses; (3) measures to facilitate rapid reconversion; (4) the suspension of most of the "rating floors"; (5) the open ending of the Controlled Materials Plan; (6) the suspension of a substantial number of "L" and "M" courses; (7) the revocation of most of the conservation orders; (8) limited relaxation on construction order L-41; (9) the encouragement of small business; (10) the replacement of CMP and other priorities for a simplified priority system; (11) a method of authorizing construction or production in certain areas to permit speedy utilization of labor and materials resources, and (12) specialized control of tin, crude rubber, certain chemicals and other materials to assure the meeting of all civilian and war requirements.

## Membership Directory Issued By Baltimore-Washington Branch

The Baltimore-Washington Branch of the American Electroplaters' Society has just issued a membership list of the Branch which gives the members' names, business connections, and addresses. In addition to that it gives not only the list of present officers, Board of Managers, President's Advisory Council and members in the armed service, but it also gives the names of the charter members and the past presidents of the Branch from 1928 through 1944, inclusive.

## Public Warned on Surplus Property Tipster Sheets

Chairman Guy M. Gillette of the Surplus Property Board recently warned the public about tipster sheets which profess to give inside information, for a substantial fee—that will get prospective buyers of surplus property in on the "ground floor." In commenting on these publications, Mr. Gillette said: "While these tipster sheets do not always come within the range of criminal action, they apparently offer little or nothing that a business man cannot get himself if he takes the trouble to inquire at any of the authorized Government disposal agencies."

## Metal Finishers Should Make a Market Analysis

Common sense tells the alert operators of metal finishing establishments of the importance of making analysis of the markets for post-war services. They recognize that this is insurance against the decline of war contracts. And, of course, they are not greatly interested in the past except as it throws light on their current and future prospects for business. They are aware that they must survey the horizons to see what new demands and methods may be in store for the metal finishing business. And they know

that a market analysis would be incomplete if it did not include an inquiry into sales methods and costs, production costs and profits on different types of metal plating and organic finishing, and capital requirements for the efficient operation of a metal finishing establishment in the future.

**Adhesion of Electrodeposits Information Sought**

Prof. Alfred L. Ferguson of the University of Michigan has appealed to the members of the electroplating industry of Baltimore and Washington for unpublished information on their efforts and methods of determining the degree of adhesion of electrodeposits to basis metals. From current reports it is believed that the Washingtonians and Baltimoreans will contribute their bit.

**Established Accounting Methods and Depreciation as Viewed by OPA**

Paul M. Green, Deputy Administrator for Accounting of the OPA, in testifying before the Senate Banking and Currency Committee on March 21, 1945, gave this definition as to what the OPA means by established accounting methods. "We maintain that established accounting methods comprise those accounting principles which have been generally adopted by recognized professional accounting bodies and leading practitioners for determining or stating economic facts in monetary terms." He continued by stating that "established accounting concepts require that the cost of assets used in production should be allowed on some equitable basis to the output of the facility. Conventional accounting practice therefore demands that depreciation be computed with respect to the useful life of the asset and not with respect to an arbitrary period of time established for other purposes. If it can be reasonably established that certain emergency facilities will have a useful life of less than five years, the Office accepts for cost purposes a rate in excess of 20 per cent. If it is reasonable to expect that the facility will be used and useful for a longer period, a rate lower than 20 per cent will be required. In other words the rate used will be established by the circumstances of the case."

**Discharged Veterans Prefer Metal Trade Courses**

The War Manpower Commission recently revealed that, since January 1, 1945, about 53 per cent of the discharged veterans enrolled in apprentice training courses in the states of New York, New Jersey, Indiana, Wisconsin, Minnesota, Georgia, Tennessee, South Carolina, Kansas, Missouri, Louisiana, Texas, Colorado, Utah and Washington were indentured in the metal trades.

**Renegotiation Act May Be Revised**

Since the Renegotiation Act expires June 30, 1945, the House Ways and Means Committee will soon schedule brief public hearings before the Act is extended for a period of time. Groups of businessmen are of the opinion that the present law should be changed in a few particulars. They feel that there should be appeals from the Tax Court on questions of law. It is their opinion that the collection of excessive profits should be stopped when such an appeal is taken. These businessmen would like the new act to provide for refunds, plus interest, with suitable appropriation.

**Form WPB-541 Has Been Revised**

In a drive to save paper and simplify the processing of priority applications, the War Production Board has revised Form WPB-541. This application blank, which is used whenever a special priorities form is not prescribed by an order or regulation, is one of the most widely used in dealing with WPB. The revised form is about 50 per cent the size of the older form.

**Incentive Wage Order Amended**

To clarify which new incentive wages, or piece rates, or changes in established incentive wage or piece rates may be made without the approval of the National War

Labor Board General Order No. 38, was amended on March 30, 1945. The revised order does not change any of the meaning of the original order, which provides for the maintenance of the established relationship between earnings and effort, but it does clarify the language to avoid misinterpretations.

**National War Labor Board Eases Wage Restrictions**

The National War Labor Board amended its General Order No. 31 on March 29, 1945, so as to permit employers using a rate-range wage system to obtain approval from Board agencies of proper plans for hiring new employees at rates above the minimum of the respective rate ranges. The amended order substitutes flexible controls suited to individual employer's circumstances for one over-all inflexible control.

**MPR No. 136 Has Been Amended**

Maximum Price Regulation No. 136, which covers electroplating and hot dip metal coating equipment, including preparatory and finishing equipment used in connection with metal coating processes, was amended on March 26, 1945. This lengthy amended regulation deals with the general principles of determining maximum prices for metal finishing equipment and terms of sale, and with methods of procedure in making applications for price adjustments, with the keeping of records, and with the making of reports to the OPA.

**Carbon Tetrachloride Control Tightened**

Schedule 78 to Order M-300 was amended on March 19, 1945, for the purpose of requiring suppliers of carbon tetrachloride to list on their consumption reports the names of customers ordering more than 3,500 pounds per month. Previously, suppliers were required to list only persons who obtained more than 7,000 pounds. The amended schedule also provides that each person who orders 21,000 pounds or more of carbon tetrachloride for delivery during the first quarter of 1945, or who orders 10,500 pounds or more for delivery during any subsequent quarter, must file with the WPB a stock and consumption report on Form WPB-3442 for each quarter.

**500,000 Electric Flat Irons to Be Produced in 1945 Second Quarter**

During the second quarter of 1945, it is expected that 500,000 electric irons will be made in spite of tightness of materials and manpower, officials of the WPB told members of the Domestic Electric Appliance Industry Advisory Committee at their March meeting.

**Electric Motors, Controls, and Equipment Must Be Identified**

Rated orders for fractional and integral horsepower motors and generators and electric control equipment which are needed for specific war uses must be identified as to ultimate end uses according to Direction to Table 6 (general Industrial Equipment) to General Schedule Order M-293 which became effective March 21, 1945. Sufficient information must be given to the supplier to enable him to identify the purpose and use of such equipment. The direction also provides that identification must be furnished with each order for items placed in the future by any ultimate user.

**Graphite Now Available to Private Trade**

The Foreign Economic Administration announced on March 17, 1945, that graphite from Madagascar, which has been reserved for purchase only by the Allied Governments since 1943, is now available for private trade. Licenses for the importation of graphite, which is subject to Order M-63, must be obtained from the War Production Board.

**Lead Order Was Amended**

Manufacturers of essential ceramics were assured a greater supply of lead for coating purposes when Order M-384 was amended on March 27, 1945, since greater restric-

tions were placed on the uses of metal in the production of all types of ceramics. All users of lead chemicals must now make quarterly reports on Form WPB-4138 on their consumption of lead chemicals.

#### Metals Reserve Company Issues First Wartime Progress Report

Charles B. Henderson, Chairman of the Board of Reconstruction Finance Corporation and President of the Metals Reserve Company, on March 27, 1945, issued the first wartime progress report on the country's success in building stockpiles of critical metals and materials. During the period from June 28, 1940, through October 31, 1944, the total income of the Metals Reserve Company amounted to over \$1,000,000,000 from the sales to the industry of such metals as antimony, chrome ore, copper, aluminum, beryllium, cadmium, lead, nickel, platinum, zinc, silver and other metals and materials.

#### Porcelain-Enameled Ware Utensils Standards Manual Issued

The past month the National Bureau of Standards released for distribution the second edition of Commercial Standard CS100-44, Porcelain-Enameled Steel Utensils. The new edition was broadened to cover both single coated and multiple coated utensils. Detailed methods of testing are included in the new edition. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents each.

#### Termination Experts Available to War Contractors

Contractors can now avail themselves of well-trained and experienced war termination specialists. With the aid of these specialists the average war contractor can be so well informed that a tremendous

amount of time and effort can be saved when the cancellation notice arrives. Anyone interested in getting such help can apply at one of twenty offices located in various parts of the United States. (1) Capt. W. A. Brooks, 494 Spring Street, N.W. Atlanta, Ga., is the ATLANTA office chairman; (2) Commander Frederick Barker, 1102 Baltimore Trust Company Building, Baltimore 2, Md., is the BALTIMORE office chairman; (3) Capt. John J. Hyland, 17 Court Street, Boston, Mass., is the BOSTON office chairman; Col. Kenneth Collins, 67 Broad Street, New York 4, N. Y., is the chairman of the BUFFALO-ROCHESTER office and the NEW YORK office; Col. John Slezak, 38 S. Dearborn Street, Chicago 3, Ill., is the CHICAGO office chairman; Col. J. C. Shoulin, Big Four Bldg., Cincinnati 1, Ohio, is the CINCINNATI-DAYTON office chairman; Col. E. A. Lynn, 1006 Terminal Tower Bldg., Cleveland 13, Ohio, is the CLEVELAND office chairman; Brig. Gen. Ray Harris, Municipal Airport Box 117, Wichita 1, Kansas, is the chairman of the DALLAS and KANSAS CITY offices; Brig. Gen. A. B. Quinton, 1832 National Bank Building, Detroit 32, Mich., is the DETROIT office chairman; Brig. Gen. Donald F. Stace, 3636 Beverly Blvd., Los Angeles, Cal., is the LOS ANGELES office chairman; Capt. F. J. Nuber, 7071 Plankinton Bldg., Milwaukee 1, Wis., is the MILWAUKEE office chairman; Col. Lynn C. Barnes, 1217 U. S. Postoffice Building, St. Paul, Minn., is the MINNEAPOLIS-ST. PAUL office chairman; H. C. Kliber, 2800 S. 20th Street, Philadelphia 2, Pa., is the PHILADELPHIA office chairman; Col. Robert C. Downie, 1202 Chamber of Commerce Building, Pittsburgh 19, Pa., is the PITTSBURGH office chairman; Capt. T. W. Mather, 600 Bryant Street, San Francisco 7, Cal., is the SAN FRANCISCO office chairman; Col. Clyde H. Morgan, 3663 Lindell Blvd., St. Louis 8, Mo., is the ST. LOUIS office chairman; Brig. Gen. D. F. Stace, Seattle Procurement Office, Seattle, Wash., is the SEATTLE office chairman, and Brig. Gen. Guy H. Drewry, 95 State Street, Springfield, Mass., is the SPRINGFIELD office chairman.

## ELECTROPLATING EXHIBIT



That the public is interested in electroplating today, was evidenced by the number of persons who viewed the exhibit of the electroplated articles and the books and magazines on electroplating at the Business and Technical Branch of the Hartford (Conn.) Public Library.

The exhibit was in the two windows of the Branch Library which is on the main street of Hartford. Due to the number of persons stopping to look, the time of exhibit was extended to three weeks rather than the two weeks generally established for exhibits.

The exhibit was sponsored by the Hartford Branch, The American Electroplaters' Society, and was under the direction of Mrs. Cleveland

Rettig, who looks after exhibits. The electroplated products of a number of the Hartford and vicinity members were on display. These were assembled by Mr. Kenneth Bellinger, a past president of Hartford Branch.

The books and the magazines were from the library\* of George B. Hogaboom.

It is believed that this is the first time that such an exhibit has been made and sets a good example for other Branch Societies of A. E. S. to follow.

\* See *Metal Finishing*, January 1944.



## Patents

### Tin Bath

*U. S. Pat. 2,370,986.* J. S. Nachtman, Mar. 6, 1945. A tin-plating bath carrying a stannous salt in a solution of an acid selected from the group consisting of hydrofluoric and sulphuric acid, a sulfonated organic substance containing the hydroxyl group, chosen from the group that consists of *o*-cyclo-hexylphenol, *o*-phenyl phenol, *p*-*p'*-isopropylidene bis-phenol and  $\alpha$ -naphthol, together with nicotine.

### Recovering Precious Metals

*U. S. Pat. 2,371,119.* F. C. Nachod, assignor to The Permutit Co., Mar. 6, 1945. A process of recovering precious metal from an aqueous liquid containing said metal in the form of anions of a complex acid which comprises placing said liquid in contact with a solid organic anion removal material containing a basic nitrogen group and capable of being regenerated with a solution of alkali whereby said metal in the form of an anionic complex is taken up by said anion removal material, then removing said liquid from contact with said anion removal material, and then separating the metal values from said anion removal material.

### Nickel Plating

*U. S. Pat. 2,371,123.* P. L. Amundsen, assignor to Parker-Wolverine Co., Mar. 13, 1945. The method of electrodepositing nickel at a cathode current density in excess of twenty amperes per square foot which comprises passing an electric current from an anode to a cathode in an aqueous bath containing nickel salts in solution therein, said bath containing nickel chloride in a concentration in excess of one-tenth normal, said current being of sufficient strength to produce an average current density on said cathode of not less than twenty amperes per square foot, said anode comprising electrolytic nickel having sufficient surface area to reduce the average current density thereon to below about three amperes per square foot.

### Corrosion Prevention

*U. S. Pat. 2,371,142.* E. R. Barnum and E. W. Zublin, assignors to Shell Development Co., Mar. 13, 1945. A corrosion-preventive composition comprising predominantly a stable, substantially neutral and chlorine free vehicle containing finely dispersed a small corrosion inhibiting amount of a free dicarboxylic acid having at least 16 carbon atoms and possessing at least one ether-type radical of an element selected from the group consisting of O, S, Se and Te, which ether-type radical branches from the carbon chain linking the carboxyl radical.

### Corrosion Prevention

*U. S. Pat. 2,371,143.* E. R. Barnum and E. W. Zublin, assignors to Shell Development Co., Mar. 13, 1945. A structural normally corrodible metal coated with a corrosion-preventive film of a free dicarboxylic

acid having at least 16 carbon atoms and possession at least one ether type radical of an element selected from the group consisting of O, S, Se and Te, which ether type radical branches from the carbon chain linking the carboxyl radical.

### Corrosion Prevention

*U. S. Pat. 2,371,207.* E. W. Zublin, E. R. Barnum and E. R. White, assignors to Shell Development Co., Mar. 13, 1945. A structure normally corrodible metal coated with a corrosion-preventive film of free dicarboxylic acid having at least 16 carbon atoms, the two acid radicals in said acid being linked through an element selected from the group consisting of S, Se and Te.

### Solvent Degreaser

*U. S. Pat. 2,371,394.* D. P. Hunter and C. A. Stine, assignors to Turco Products, Inc., Mar. 13, 1945. In apparatus for removing carbonaceous deposits from articles by means of a solvent solution the combination of a container for the solution, means for heating the solution in the container to a point sufficient to vaporize a portion thereof and means for condensing and refluxing the vaporized portion whereby to maintain the heated solution substantially at its initial strength and volume, said last-named means comprising walls defining a passageway communicating at one end with the container, cooling tubes disposed one above another in the passageway and baffle members secured to the respective tubes and projecting therefrom at opposite sides of adjacent tubes, each of the baffles extending from the tube to which it is secured to the adjacent wall of the passageway whereby to direct the vapors in a tortuous path around the several tubes until they are condensed, fluid-passing perforations through the baffles whereby to permit reflux of the condensate to the container and suction means communicating with the other end of the passageway.

### Sandblast Mixer Valve

*U. S. Pat. 2,371,434.* A. H. Eppler, Mar. 13, 1945. A sand blast mechanism including the combination with a sand supply hopper, of a mixing chamber and a rubber tube connecting the hopper with the mixing chamber for sand delivery to the latter, said tube having a throat portion providing a constricted passage, elongated in cross section, and also having an adjacent portion enlarged relatively to the throat and end portions of the tube, a chambered fitting having upper and lower end portions clamped to the hopper and mixing chamber, respectively, with the ends of said tube interposed, and manually adjustable means carried by the fitting for applying pressure to opposite sides of the throat portion, whereby the flow of sand to the mixing chamber may be regulated, said mixing chamber having a sand blast outlet and an air blast inlet aligned therewith.

### Stripping Deposits from Magnesium

*U. S. Pat. 2,371,529.* W. S. Loose, assignor to The Dow Chem. Co., Mar. 13, 1945. In a method of removing electrodeposited coatings of a metal selected from the group con-

sisting of iron, cobalt, and nickel from the surface of articles formed of magnesium and magnesium-base alloys, the steps which comprise immersing the article in a solution consisting of water and from about 10 to about 50 per cent by weight of hydrofluoric acid and a lesser proportion of a mineral acid selected from the class consisting of nitric, sulfuric, hydrochloric, hydrobromic, and hydriodic acids and passing current through the article to cause it to function as anode in said solution at a current density between about 10 and about 100 amperes per square foot for a time sufficient to remove the metal coating.

### Degreasing Solvent

*U. S. Pat. 2,371,644.* W. H. Petering and A. G. Aitchison, assignors to Westvac Chlorine Prod. Corp., Mar. 20, 1945. As an improvement in methods of degreasing surfaces of metals of the class consisting of aluminum and its alloys having a decomposing effect on chlorinated hydrocarbon solvents, the improvement which comprises contacting such metal surfaces with a solvent composition comprising a chlorinated hydrocarbon grease solvent and a minor amount of an oxygen-containing compound having the following formula



wherein R represents a divalent aliphatic radical and X represents a substituent of the class consisting of hydrogen, alkyl, amino, alkyl, alkoxy and hydroxy groups and having the property of restraining decomposition of chlorinated hydrocarbon in the presence of said metals, the chlorinated hydrocarbon grease solvent being normally subject to decomposition in contact with such metal surfaces during degreasing and the amount of said oxygen-containing decomposition of the chlorinated solvent.

### Degreasing Solvent

*U. S. Pat. 2,371,645.* A. G. Aitchison and W. H. Petering, assignors to Westvac Chlorine Prod. Corp., Mar. 20, 1945. As an improvement in degreasing surfaces of aluminum and its alloys with chlorinated hydrocarbon solvents normally subject to deterioration in the presence of aluminum, the improvement which comprises maintaining in admixture with such chlorinated solvents, a minor amount of an organic ether to inhibit such metal-induced decomposition thereof.

### Degreasing Solvent

*U. S. Pat. 2,371,646.* W. H. Petering and A. G. Aitchison, assignors to Westvac Chlorine Prod. Corp., Mar. 20, 1945. As an improvement in degreasing surfaces of aluminum and its alloys with chlorinated hydrocarbon solvents normally subject to deterioration in the presence of aluminum, the improvement which comprises maintaining in admixture with such chlorinated solvents, a minor amount of an organic oxime to inhibit such metal-induced decomposition thereof.

### Degreasing Solvent

*U. S. Pat. 2,371,647.* W. H. Petering and A. G. Aitchison, assignors to Westvac Chlorine Prod. Corp., Mar. 20, 1945. As an

*Cowles*

# LIXOL

**EMULSION TYPE SOLVENT CLEANER**

**FOR PRE-SOAK BEFORE  
ALKALINE CLEANING**

A valuable, safe, efficient, penetrating cleaner and degreaser for any metal. LIXOL will not attack the metal and is non-toxic. It gives an anti-rust surface on ferrous metals when desired. Use LIXOL in still tank, washing machines and pressure type washers. Ready to use and economical, too. Send for trial drum — prompt shipment.

*Cowles* TECHNICAL SERVICE  
ON REQUEST

**THE COWLES DETERGENT COMPANY**

**METAL CLEANER DEPARTMENT**

7016 EUCLID AVENUE • CLEVELAND 3, OHIO

improvement in degreasing surfaces of aluminum and its alloys with chlorinated hydrocarbon solvents normally subject to deterioration in the presence of aluminum, the improvement which comprises maintaining, in admixture with such chlorinated solvents, a minor amount of a carboxylic acid ester to inhibit such metal-induced decomposition thereof.

#### Lead Coating Steel

*U. S. Pat. 2,371,725.* J. H. Young, assignor to E. I. duPont de Nemours & Co., Mar. 20, 1945. The process which comprises coating a ferrous metal surface with copper and bringing the copper-coated surface into contact with molten lead in the presence of molten sodium cyanide.

#### Bus Bar

*U. S. Pat. 2,372,155.* L. L. Bosch, assignor to R. E. Kramig & Co., Inc., Mar. 20, 1945. A bus bar having upon its surface a plurality of facets which are angularly arranged with respect to an axis taken through the plane of configuration of the bar in such manner as to direct heat radiation coming toward the bar at right angles to the plane of configuration away from the bar at an angle other than a right angle.

#### Silicate Coating

*U. S. Pat. 2,372,285.* H. M. Marc and H. W. Geider, assignors to The Philip Carey Mfg. Co., Mar. 27, 1945. A rigid article surface coated with a hardened inorganic coating which is composite in character and which comprises a base layer and a superficial layer, said base layer being the product of drying and heat curing an aqueous composition, that contains soluble silicate of which at least about 50% is potassium silicate and that contains at least about 5% of kaolinitic type clay (by dry weight of solids in the base layer), to insolubilize said soluble silicate and harden said base layer to a solubility index not greater than 20, the insolubilized soluble silicate being at least about 30% by weight of the base layer; and said superficial layer being the product of drying and heat curing at a temperature of about 300°F. to about 600°F. an aqueous composition applied to the heat cured base layer and consisting of soluble silicate of which at least about 75% is potassium silicate, to insolubilize said soluble silicate and harden said superficial layer to a solubility index not greater than 35.

#### Plating Fixture

*U. S. Pat. 2,372,296.* J. T. Saas, Mar. 27, 1945. A plating fixture comprising a substantially rectangular frame having opposed anode-supporting side members each of which is provided with means for supporting the same from a positive bus bar, the said frame also including end members connecting opposite ends of the side members, the end member adjacent to the ends of the anode-supporting side members which are adapted to be supported from the bus bar being of conducting material and the other of said members being of insulating material, a block of insulation secured to the first end

member intermediate of the ends thereof, a cathode hanger secured to the said insulating block and extending downwardly therefrom substantially midway between vertical planes including the side members, a second cathode hanger secured to the central portion of the second end member and extending downwardly therefrom and provided with means for supporting the same from a negative bus bar, clamping bars for securing to each side member one or more anodes adapted to extend downwardly into the electrolyte, bolts for securing the clamping bars to their respective side members, and means for securing to the cathode hangers the members to be plated.

#### Plating Fixture

*U. S. Pat. 2,372,297.* J. T. Saas, Mar. 27, 1945. In an electroplating apparatus, means for supporting a hollow object within the electrolyte of said apparatus, said means comprising a base bar adapted to form part of a cathode support, a hollow supporting member rigidly secured to said base bar, and a complementary hollow supporting member having a foot therewithin adapted to rest upon the base bar and projecting toward the interior of the other supporting member, the said supporting members having each an outer wall provided with an external surface shaped to conform to the inner surface of a hollow object to be supported thereby, a bolt extending through the base bar and through an opening in the said foot, a nut on said bolt for clamping the second supporting member to the base bar, and a bolt extending through the external wall of the first mentioned supporting member and adapted to engage an internal portion of the second supporting member thereby to separate the said members and to enable the external surfaces thereof to engage the inner surface of a hollow object to be supported thereby.

#### Dust Collector

*U. S. Pat. 2,372,316.* H. W. Curtis, assignor to B. F. Sturtevant Co., Mar. 27, 1945. A dust collector comprising a casing a plurality of spaced, substantially vertically extending tubes in said casing; a dust hopper attached to said casing below said tubes, a substantially horizontal plate extending across said casing above said tubes, means forming a plurality of relatively small nozzles in said plate aligned with said tubes, an outlet duct having a substantially horizontal lower wall attached to said hopper and having a substantially horizontal upper wall attached to said plate, and a substantially horizontal partition extending across said casing above said lower wall of said duct, said partition having perforations therein through which said tubes extend, said partition and said lower wall forming a passage into said outlet duct for dust free gas from said hopper.

#### Plating Process

*U. S. Pat. 2,372,488.* F. W. Hampson, assignor to Plating Processes Corp., Mar. 27, 1945. In an electroplating process, the method of confining the deposit of plate to a localized area of the surface to be treated

which consists in applying to said localized area a relatively weak adhering shield of colored material so as to cover the same exactly, then immersing said entire surface in a strongly adhering resist material of such character as to form on said surface a shield of a transparent material which will be unaffected by an electroplating action and through which said underlying shield of colored material may be seen, cutting through the second named shield around the bordering edges of said first named colored shield and subjecting said surface to the action of an electroplating bath for the deposit of metal upon the unshielded area of said surface, and finally removing from said surface the remainder of said second-named shield.

#### Tank Leak Detector

*U. S. Pat. 2,372,489.* F. W. Hampson, assignor to Plating Processes Corp., Mar. 27, 1945. In a tank having an electrolyte confining wall, a leak detector for said wall comprising a terminal of an electric circuit in constant contact with the electrolyte inside the wall, a second terminal of said electric circuit comprising a conducting strip of relatively narrow adhesive tape positioned at the lowermost outside corner of said tank so as to overlap only a narrow area of the wall of the tank adjacent said lower corner said tape being normally insulated from the electrolyte within said tank but arranged whereby electrolyte leaking through said wall will flow by gravity into contact with said conducting tape and thereby close the electric circuit.

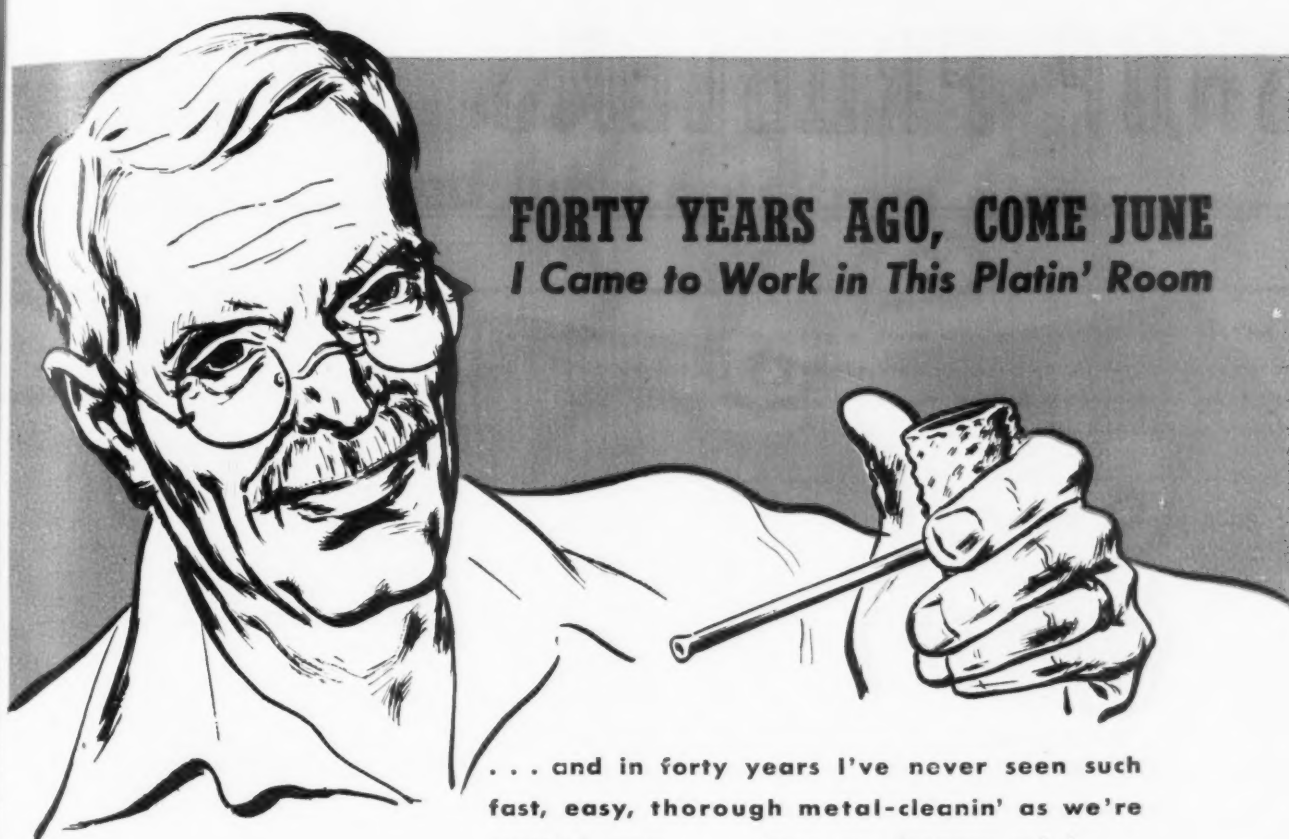
#### Electrolytic Cleaning

*U. S. Pat. 2,273,599.* J. S. Nachtman, Mar. 27, 1945. The method of continuously cleaning the surface of a moving metal strip to remove foreign material therefrom, which consists in applying aqueous liquid to said strip, tangentially brushing the liquid-carrying surface of said strip with a rotating metallic brush electrically connected to one terminal of an electric generator, and passing an electric current from said brush to the strip.

#### Plating Printing Cylinders

*U. S. Pat. 2,372,665.* A. U. Egli (Switzerland) and C. Bokenkamp (Germany), Apr. 3, 1945. In a method of making a printing roll having a removable smooth, dense metal coating of a thickness suitable for etching and printing, the steps of providing a rotating base cylinder having a smoothly finished cylindrical surface, electrodepositing metal for forming said coating on said smooth surface, providing a roller in rolling contact with said deposited metal coating, and moving said roller for progressively rolling said deposited coating under pressure in overlapping areas on a substantially helical path along said cylinder as said metal is being deposited while maintaining the axis of rotation of said roller in such transverse relation to said path as to insure substantially only rolling contact between said deposited coating and said roller and substantially prevent frictional rubbing between said deposited coating and said roller as the latter moves in said path.





**FORTY YEARS AGO, COME JUNE**  
*I Came to Work in This Platin' Room*

... and in forty years I've never seen such  
 fast, easy, thorough metal-cleanin' as we're  
 gettin' now ... since we began usin' ...

## **KEMTEX No. 100-A**

A typical report; for plant after plant has adopted this effective, economical, time-saving electrolytic cleaner for brass, copper and other non-ferrous alloys. It cleans thoroughly, without surface-etch, and may be used anodically or cathodically.

KEMTEX No. 100-A is only one of the KEMTEX family of compounds; each formulated for its specific job: soaking; immersion; washing machine or electrolytic application; stripping; abrasion.

Still other compounds are constantly being formulated in our laboratory; to keep pace with — often to anticipate — the constantly-changing requirements of industrial development.

One or more of these highly specialized compounds will help you solve your present problem — and speed your preparations for meeting post-war competition.



For time-saving, money-saving suggestions on metal-cleaning and finishing, simply tell us about your product and describe your present methods and equipment.

**W.D. MACDERMID** *Chemical Company*  
 BRISTOL, CONNECTICUT

# SHOP PROBLEMS

PLATING AND FINISHING  
POLISHING — BUFFING  
CLEANING — PICKLING  
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

## Nickel-Chromium Bath

**Question:** We have an item of Brass and one of Steel which we would like to nickel and flash chrome plate at the same time in the same solution. Is it possible to do this without contaminating the plating solution or producing an inferior finish on the items? If it is impossible or impractical to plate these two items at the same time, we would appreciate the reasons.

If you are unable to give us this information, perhaps you can suggest someone who could. Anything you can give us would be greatly appreciated.

W. C. Co.

**Answer:** We regret to advise that this is not possible, since the solutions are entirely different, and incompatible.

It will be necessary to first nickel plate the article, and then chromium plate in a separate bath.

## Specifications

**Question:** We are desirous of obtaining some information with reference to the finishing of products for post-war.

Do you know of any collection of specifications, which control the finish of a product both as to workmanship and materials, to be used to suit customers requirements?

We see today products classified as war-time finish, object being to save labor and material. In post-war customers requirements will probably vary tremendously. Is there any publication available at the present time which will help us to determine the various specification requirements for finishing?

- (1) Smoothness and general appearance of castings ferrous and non-ferrous.
- (2) Finishes, including paint, synthetic enamel, electroplating, metallizing. (This should cover material to be used, method of application, thickness and appearance.)

L. O. I. R.

**Answer:** We would suggest that the specifications of the American Society for Testing Materials be used as a basis for establishing specifications for commercial products.

Specifications, however, must be determined by the manufacturer for each product, since the requirements with regards to workmanship and finish will depend on the use to which the article is to be put.

## Sources of Equipment

**Question:** With reference to purchasing a chromium plating outfit.

We are particularly interested in purchasing a small outfit that is suitable for chromium plating dental forceps and other small pieces of metal that are used in a dental office such as scalers and explorers. These instruments average about eight inches in length and two inches in width.

Your firm was recommended to us as a source whereby we could get the information necessary.

We are in a position to rate an AAA priority.

W. D. S. Co.

**Answer:** Equipment may be obtained from manufacturers of electro-plating equipment, and we enclose tear sheets from our 1944 *Buyers' Directory* listing such suppliers.

You know, of course, that it will be necessary to polish and nickel plate your instruments before chromium plating.

## Electrolytic Screen

**Question:** It is our belief that several concerns in the east are using metal screens for processing paint and lacquers on various surfaces. These screens were formerly made of silk and from that the term silk-screening process was derived.

Can you tell us the method to use to obtain a smooth plate on stainless steel of 150 mesh so that all spaces between the wires are filled and a smooth flat surface is obtained except where we wish an image to be left? We would print resist of the image we desired on the screen which would leave this portion of the screen unplated.

K. R. D. Corp.

**Answer:** The production of electrolytic screen is the subject of about a dozen patents. Such screens, however, may be obtained from Metaltex, Inc., Berkeley Heights, N. J., and from C. O. Jeliff & Co., Southport, Conn.

## Copper Plating Solution

**Question:** We would like to have your opinion on the best type of copper plating solution to use for carburizing steel parts. We had formerly used a bath containing only copper cyanide and sodium cyanide,

this was mostly controlled by the head plate by guess in making additions.

I, as a chemist did not believe the solution given was efficient, and as we now have laboratory control, I have recommended this formula as is published in the literature:

Copper cyanide	..... 3	oz./gal.
Sodium cyanide	..... 4.5	"
Sodium carbonate	..... 2	"
Sodium hydroxide added	.....	to pH 12.

This solution seems to give good results but there is some controversy concerning this and I was advised to write you for an opinion, or your idea of a suitable formula for carburizing.

R. R. C.

**Answer:** The formula given should be satisfactory, but you will find that the addition of Rochelle salts will permit higher current densities with higher efficiency.

We suggest the following formula:

Copper cyanide	..... 4	oz./gal.
Sodium cyanide	..... 5 1/4	"
Sodium carbonate	..... 4	"
Rochelle salts	..... 6	"
Sodium hydroxide	.....	to pH 12.6.
Temperature	.....	140°F.

## Discoloration

**Question:** We are having considerable numbers of our variable condensers returned to us because of discoloration in the nickel plating when the condensers are exposed to air for a few days.

The operations in plating are as follows: (1) The materials are hung on racks and given an alkali dip. (2) Materials put in cold water and thoroughly rinsed. (3) Materials given an acid dip consisting of one quart sulphuric to one quart nitric acid. (4) Cold rinse. (5) Copper flash put on the brass material. Material left in copper plating tank long enough to cover all surfaces with copper plate. (6) Cold rinse. (7) Material inserted in nickel plating tank for ten minutes at 20 amps. Removed, given cold water rinse, the water blown off by air and material put in sawdust and dried. Nickel solution: 13 oz. single nickel salts, 6 oz. nickel chloride, 2 oz. boric acid per gallon. Nickel tank contains 100 gallons and one pound caustic soda added to bring the pH up.

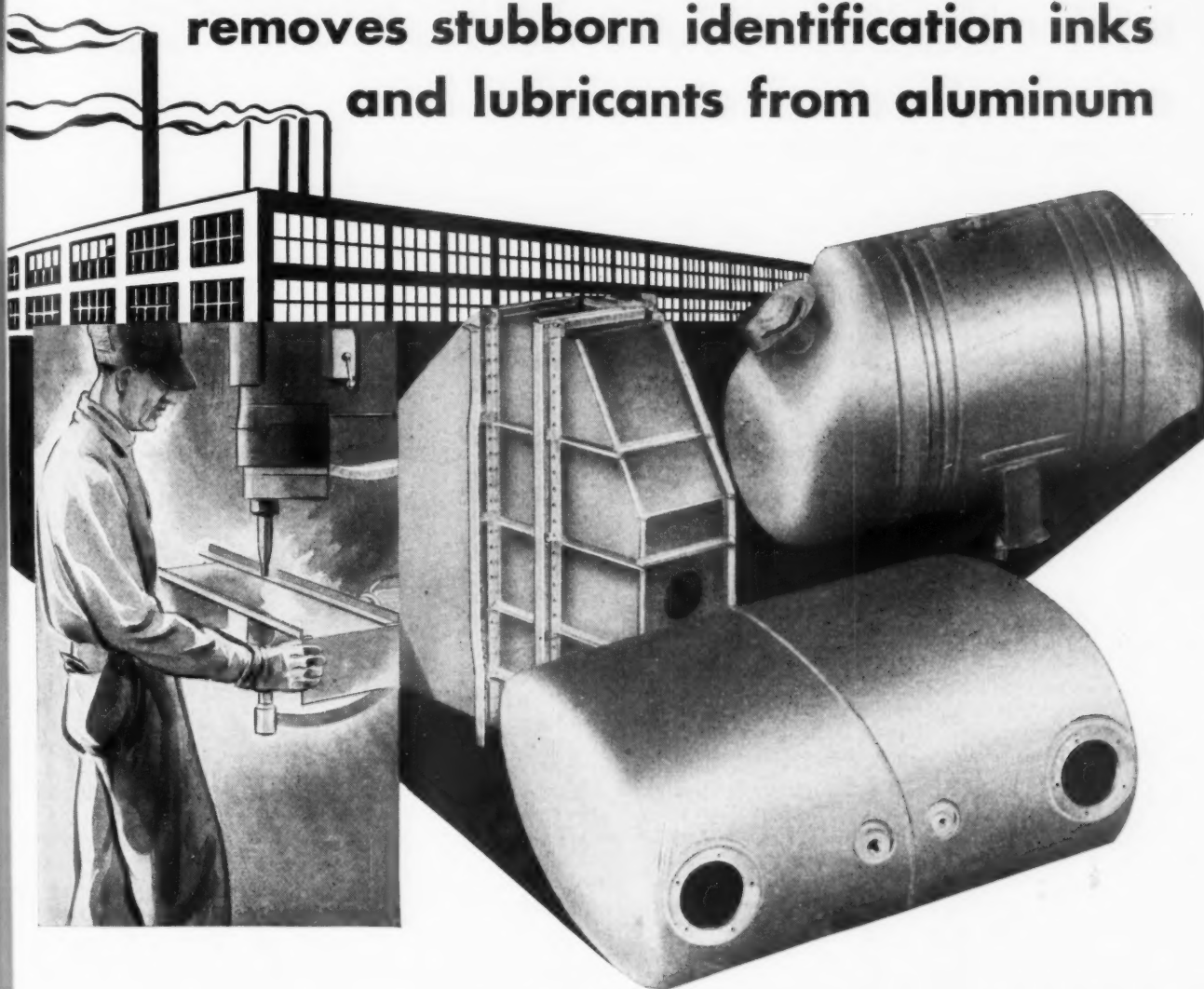
W. N. J.

**Answer:** It is possible that the brass is tarnishing through the nickel deposit which would be very thin between the condenser plates. This can be checked by immersing the tarnished condensers in a solution containing about 4 oz./gal. of sodium cyanide. If the tarnish film is removed in this solution it will indicate that the situation is due to insufficient thickness of nickel deposit.

(Continued on page 236)

# How **WAR PLANT**

**removes stubborn identification inks  
and lubricants from aluminum**



## **DIVERSEY D-C No. 36 cuts anodizing and spot welding rejects**

### **EXPERT HELP ON METAL CLEANING**

If you need help on any metal cleaning . . . or working . . . problem, just call for the DIVERSEY D-Man. Backed by a Research Laboratory that has spent 20 years developing special purpose products, he is always on deck to lend a helping hand . . . often finds ways to step up production with less manpower.

**DIVERSEY**

**D-MAN**

Officials in a midwest war plant wanted to reduce the number of rejects on anodized and spot welded aluminum parts. Investigation by a Diversey D-Man showed that cleaning solutions then in use did not *completely* remove: 1. lubricants used in forming operations: 2. stubborn identification inks.

DIVERSEY D-C No. 36 in still tank solution was recommended. After the change was made, rejects were practically eliminated, cleaning time was reduced and production increased. Also, tank solution had a longer life, white film disappeared, and the new solution was 100% free rinsing.

Repeated laboratory tests and wide usage in the field prove that DIVERSEY D-C No. 36 removes all

kinds of contamination *faster*. Inks only partially removed in 10 to 15 minutes with ordinary cleaners, for example, are completely removed in 4 to 5 minutes with D-C No. 36. And there's no risk of staining, pitting, or corrosion.

Excellent cleaning with D-C No. 36 is largely due to carefully determined wetting and emulsifying properties. Economical operation is assured by superior water softening action. Get acquainted with this ideal cleaner . . . to prepare aluminum for anodizing, welding, painting or matte finishing. For a liberal experimental sample and complete information, write to: Metal Industries Department.

**THE DIVERSEY CORPORATION**  
53 West Jackson Boulevard • Chicago 4, Ill.



# NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

## Detergents

The Optimus Detergent Co., Dept. MF, 128 Church St., Matawan, N. J., has announced a new line of industrial metal cleaning materials, designed to cover a wide range of specific applications. Emphasis is placed on the use of the proper detergent in conjunction with the correct cleaning method. The new products are announced as available in Alkaline, Acidic, Solvent and Emulsion types. A new folder describing the products entitled "Announcing Dependable Optimus Detergents" has just been issued.

## Poly Phosphate Comparator

Low concentrations of the poly (glassy) phosphates, such as hexameta, pyro, septa, etc. (threshold treatment), are coming into more and more general use. They are employed in power plants and hot water systems to prevent feed line deposition; in air conditioning and refrigeration units, laundries, dish washers, milk handling equipment, etc., to prevent deposition and corrosion; in municipal and process waters to



stabilize the water and prevent corrosion (red water); in photography to prevent deposition on film and paper; etc. A simple, rapid and accurate method of analysis is therefore imperative.

The Taylor Poly Phosphate Comparator, developed by W. A. Taylor & Co., Dept. MF, 7300 York Road, Baltimore, Md., is ideal for this purpose. Previous methods required several hours boiling to convert the glassy phosphates to the ortho form. By the Taylor method a complete determination requires only 20 minutes. After conversion, two reagents are added separately and the blue color formed is compared with the standards. This gives the total phosphate content. A determination on the cold sample (no boiling) gives the ortho present in the sample. The difference is the poly phosphate.

The outfit consists of a comparison block containing 8 standards 0, 0.5, 1, 2, 4, 6, 8, 10 ppm, 2 comparison tubes, funnel, filter paper, graduate, flask, and reagents. All equipment is contained in a wooden carrying case 9¼ in. long, 6¼ in. wide and 9 in. high.



## Industrial Parts Washer

A new, automatic washer for industry has recently been put on the market by the Modern Mechanic Co., Dept. MF, 122 South Michigan Ave., Chicago 3, Ill. The heavy duty model above includes rinse vats for production-line work. One man can operate three baskets of metal parts, washing, rinsing and draining each basket at the same time.

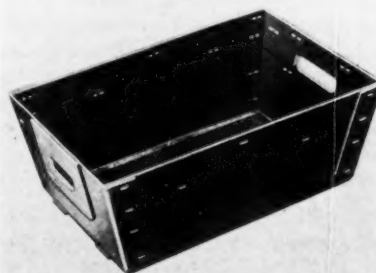
The Modern Mechanic's impeller pump is powered with a ½ H.P. single phase motor and forces a ton of solvent every minute over parts to be washed, quickly and efficiently removing acid, grime, grease, etc. Only 65 gallons of washing liquid are used and it is automatically screened by baffle-and-grill so it can be used over and over. The settling action for dirt and chips provided for in design of this machine is only one of the many patented features of Modern Mechanic.

Service required is reduced to a minimum because there are only three moving parts: a motor, impeller and V-belt.

Further information may be obtained by writing the company.

## New Toter

Although originally produced under the pressure of war emergency to replace metal utility baskets using critical material, these All-Purpose, newly improved Toters offered



## Professional Directory

### Platers Technical Service Co.

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Complete services, including solution analyses, process development and deposit tests  
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MEMBER A.E.S.

RE-CONVERSION AND PREPARATION FOR  
PEACE-TIME PRODUCTION — SPECIALIZATION

FOR HIGH ALKALINITY pH MEASUREMENT...

FOR HIGH TEMPERATURE pH MEASUREMENT...

FOR YOUR PARTICULAR pH MEASUREMENT...

Get the instrument  
Beckman engineers  
have perfected for the job!

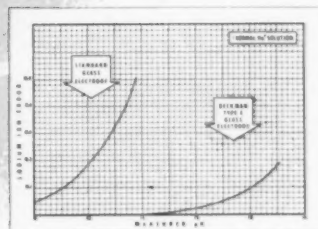
**P**ROPER pH control of processing operations is one of the most important industrial developments in recent years. Step after step in the development of this modern tool has been pioneered by the Beckman research staff—bringing reduced spoilage, improved product quality and lower production costs to thousands of different plants in a wide variety of industries.

Through these years of pioneering, the Beckman organization—world's largest manufacturer of glass electrode pH equipment—has developed advanced types of pH electrodes found nowhere else in the industry... unique electrode assemblies that open up entirely new fields to the greater profits and higher production efficiencies obtainable through accurate pH control.

Among the many pH problems solved by Beckman engineers, the following are typical...

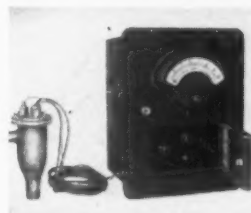
**HIGH ALKALINITY** Even in highly alkaline sodium solutions—a difficult or impossible application with other glass electrode pH equipment—you can obtain uniform accuracy with Beckman equipment. The Type E Glass Electrode—an exclusive Beckman development—makes measurements up to pH 13.5 with a sodium error of only 0.2 in 1 Normal Sodium solutions. In chart at right, above, compare this accuracy with that of standard glass electrodes. This advanced development is of tremendous value in highly alkaline

plating processes... in soap solutions... in processing detergents, cleaners and many other applications. Investigate what this exclusive Beckman development can mean to your present or future plant processing operations!



**HIGH TEMPERATURES** If yours is a process involving high temperatures, remember that Beckman—and only Beckman—has perfected a High Temperature Glass Electrode that can be used continuously in boiling hot solutions. This advancement is particularly useful in many food processes... in boiler feed water conditioning... and in a wide range of chemical processing operations.

**HARD SERVICE** Still another typical Beckman development is the "X9" Electrode—a glass electrode particularly designed for unusually severe operating conditions such as continuous immersion in paper pulps, in ore slurries and other abrasive materials. So sturdy is this electrode that it withstands more than 100 pounds direct force on the immersion end without breaking, and its thick walls withstand an unusual amount of abrasion.



The Beckman Automatic pH Indicator—the most advanced pH instrument available today.



The Beckman Industrial pH Meter—ideal for portable plant and field use.

**WHATEVER** your pH measurement or control problem, let the Beckman research staff study your particular requirements and recommend the type of pH installation you should have. You will get the most advanced pH equipment available—equipment that will still be modern years from now.

**FREE!** "What Every Executive Should Know About pH"—a simple non-technical explanation of pH control, what it is, how it's used. Send for your copy today!



**BECKMAN INSTRUMENTS**  
NATIONAL TECHNICAL LABORATORIES • SOUTH PASADENA 9, CALIF.

**INSTRUMENTS CONTROL MODERN INDUSTRIES**



by Andrew Technical Service, Dept. MF, 3553 N. Halsted St., Chicago, Ill., are now preferred in many instances to metal units because many specific advantages have been demonstrated.

In specialized industry, the trend is strongly toward this non-metal Toter, widely applicable to shop use, stock rooms, shipping room—even office use for handling mail, stationery, material on way to file, etc. Jobbers of electrical parts, surgical supplies, office supplies, laboratory supplies, hardware and other sundries have found them just the thing for assembling orders. Rigidly constructed of special impregnated, compressed fibre-board of great strength, these Toters possess enough "give," unlike metal or wood, making them ideal for glassware or other fragile articles.

Other advantages worth noting are: water and oil resistant—saves wear and tear on tables, conveyors, counters—sloping sides allow stacking to save space when not in use. They are quieter—no metallic clang, or nerve wracking din. To take hard knocks, rims are strengthened with extra reinforcement (triple-thick around handle slots). Wood cleats fastened to under-side, serve as skid bars to facilitate sliding, also add strength and rigidity. Available for immediate delivery in three handy sizes.

### Wheelabrator Swing Table

The Wheelabrator Swing Table, manufactured by American Foundry Equipment Co., Dept. MF, 555 South Byrkit St., Mishawaka, Ind., which utilizes the Wheelabrator airless abrasive blasting unit, extends the speed and economy of airless blast cleaning to a wide range of intricate or irregular shaped work formerly cleaned in air blast rooms in jobbing foundries and other metal working plants.

Four sizes of this blast cleaning machines are now available with sizes of the single work table being 24", 66", 72" and 86" in diameter. Operation of the four units is essentially the same, the machines varying only in minor construction details and number of Wheelabrator units utilized.

Work to be cleaned is placed upon a rubber-covered work table which is mounted on the door of the blast cabinet. As the door is closed, the work table swings into

the cabinet underneath a Wheelabrator airless blast unit. While in this position the table is rotated at a predetermined speed. The Wheelabrator unit whips a continuous stream of abrasive down upon the rotating work to the full width of the table so that all surfaces are uniformly blasted to a bright, clean finish.

Only a very short exposure of the parts to the Wheelabrator unit is required to clean the exposed surfaces thoroughly and uniformly. The Wheelabrator unit is then stopped, the door is swung open and the part is turned over for cleaning on the underside.

After striking the work, the abrasive falls through perforations in the table top into a hopper below the machine. A screw conveyor transfers the abrasive to the elevator boot section from which it is carried to an overhead abrasive separator. All broken down abrasive and useless fines are removed and the usable abrasive falls into a storage hopper for reuse.

One of the most important features of the Wheelabrator Swing Tables is that all blast cleaning operations are within the cabinet; the operator is never exposed to the abrasive blast or dusty conditions inherent in air-blast room cleaning.

### Spraying Nuglu

The latest research development of the J. T. Siefen Co., Dept. MF, Detroit 9, Mich., is the use of a spray gun for recoating polishing wheels and belts with either Nuglu or Brushing Nuglu.

Benefits of this method are faster production in setting up wheels and belts by at least five to one and a more uniform wheel or abrasive belt which gives a better finish.

The use of the spray gun with Nuglu or Brushing Nuglu is far-reaching and can be adapted to practically all recoating problems. It can be made automatic or it can be adapted to automatic polishing machines, as well as to individual polishing operations right on the job. In the set-up room it has been especially successful.

The best feature, of course, is speed and the use of materials without waste on your recoating jobs.

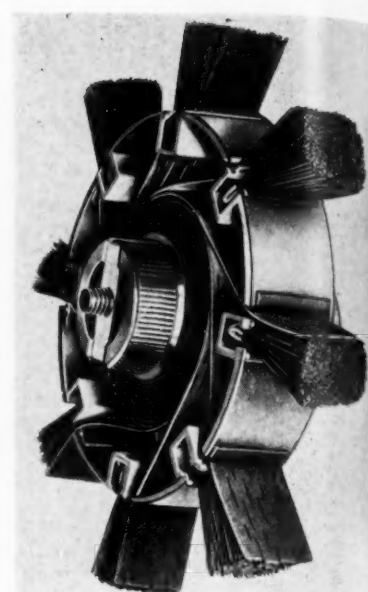
Details will be gladly given by the company regarding type of equipment used and the best method of application.

### Sanding Wheel

A new, brush-backed sanding wheel to be known as the Sand-O-Flex has just been announced by the Exactone Tool & Die Co. It sands, burrs, finishes woods, metals, plastics, rubber products and many types of special materials. The outstanding feature of this sanding device is its adaptability to jobs that were formerly done only by hand.

The device consists of a central magazine which houses the strip abrasive. Eight of these strips extend through the housing and are held against the work by tough bristles. The bristles "cushion" the abrasive, making it possible to get in and around corners, hollow and fluted surfaces, and small openings.

The body and cover of the Sand-O-Flex are cast from Zamak. Overall diameter

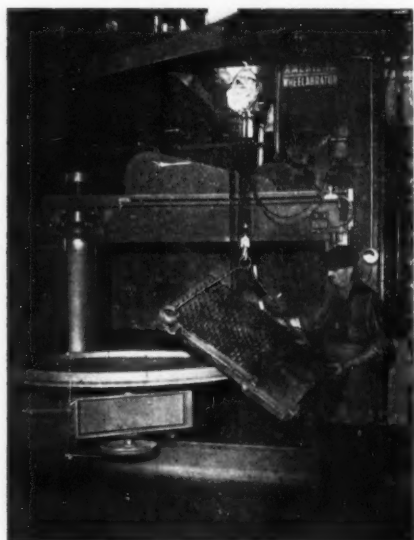


(including brushes) is approximately 12 inches. Weight fully loaded is about 2 3/4 lbs. Normal loading contains 20 feet of abrasive. Reloading is done simply by unscrewing the serrated nut and removing the cover. A wide range of abrasives of various grits and grades are supplied for use with the sander. These cartridges, plus the quick-change feature, permit the same tool to be used for all operations from rough stage to polished surface.

The Sand-O-Flex fits all standard 1/2" and 5/8" motor shafts, stationary or flexible, and can be supplied to fit almost any shaft on request. A 1/4 hp electric motor will handle all normal operations as will most portable electric tools. Motor speed of 1750 rpm is recommended, decreasing in proportion to the coarseness of the abrasive used and according to the results desired. No particular skill is required to operate it, nor is much pressure necessary to obtain a good finish—the abrasive does the work. Light in weight, the sander is particularly suitable for use on a flexible shaft.

### Acid Inhibitor

An organic acid pickling inhibitor in powdered form, designated Pennsalt PM-40 has recently been developed by the Pennsylvania Salt Manufacturing Co. This material is highly stable and is completely soluble in pickling baths of either muriatic or sulfuric acid. It contains 100% active ingredients and is highly effective at very low concentrations as 0.02% to 0.10% by weight of the pickling bath. Concentration may be varied to meet plant conditions, production rate, and quality of surface desired. This material effects economies in both acid and metal, while minimum quantities of inhibitor are required. Due to high metal protection the acid is consumed principally in scale and rust removal with the result that the useful life of the bath is prolonged. Pennsalt PM-40 can be used in acid pickle baths prior to electroplating, galvanizing, and enameling since it is free rinsing and minimizes hydrogen absorption. Packaged in drums of 25, 100, and 200 pounds, it is available in commercial quantities.

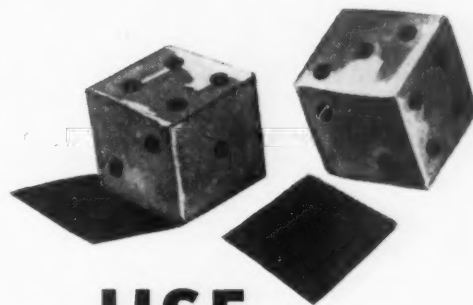






**WHEN YOU  
NEED A TOUGH  
DURABLE RACK  
COATING ...**

**Don't  
Gamble ... USE**



**DUOPLASTIX**

TRADE MARK REG. U. S. PATENT OFFICE

**LET US PROVE IT!  
SEND US A RACK  
OR SET OF RACKS  
FOR A TRIAL COAT-  
ING — NO CHARGE  
OR OBLIGATION.**



*The all purpose Rack Coating*

Production proven — no "snake-eyes" or "box cars" — chance is eliminated by coating your plating racks with "DUOPLASTIX INSULATION." This different all purpose *plastic* insulation is completely non-oxidizing — possesses true adhesion that prevents seepage and blistering — high chemical resistance for both acid and alkaline baths, either hot or cold. Surface does not *wet* easily — no drag-out. Duoplastix Insulation's toughness and resiliency produces unequalled mechanical abrasion and shock resistance and its retention of flexibility makes it doubly desirable for use on "spring type racks." DUOPLASTIX INSULATION has created a new high in rack life and service. Available in 1, 5 and 55 gallon containers.

**Wyandotte Paint Products Company**

**INSULATION DIVISION  
WYANDOTTE, MICH.**

# TYGON PAINT



## Acid-Alkali-Water and Corrosion Resistant

**TYGON PAINT**, a liquid formulation of Tygon sheet stock (the flexible plastic used to line plating and pickle tanks), will resist spillage or fumes from all plating or pickle solutions. Ideal for lasting protection for walls, structural steel, tank and equipment exteriors, fume hoods, etc. Available in white, black, clear, gray, red, green, and aluminum.

- Apply Cold by Brush or Spray Gun
- May Be Air Dried or Baked
- Easy to Use

There's a Tygon Dealer near you:  
**IN DETROIT**  
it's the  
**GEO. L. NANKERVIS CO.**  
5408 Commonwealth Ave.  
TYLER 6-8911

**Masking Materials**—Tygon Tempco-ec, a liquid masking material applied by spray, dip, or brush. Air dries 4-6 minutes. Peels easily free.

**Hook and Rack Coverings**—Tygon flexible tape and tubing for protection of hooks and racks. Will not take a plate; resists all plating solutions; lessens current losses.



**U. S. STONEWARE**

*Since 1865 • Akron, Ohio.*

ties for bulk pickling operations through the Special Chemicals Division of the Pennsylvania Salt Manufacturing Co., Dept. MF, 1000 Widener Bldg., Philadelphia 7, Pa.

## Twin Turret Fluorescent Lampholder

A fluorescent lampholder known as the Twin Turret, entirely new in design and construction, which holds the lamp securely in contact, has been announced by the accessory equipment division of General Electric Co., Dept. MF, Bridgeport, Conn.

The new lampholder is made for use with 40-watt lamps. It has a husky metal casing

with insulated face and holds two Mazda F fluorescent lamps. Starter sockets are an integral part of the lampholder and are located between the lamps. They will accommodate either FS-40 G-E Watch Dog starters or conventional FS-4 starters.

The new Twin Turret lampholder will eliminate the costly replacement of broken lampholders and will provide positive protection against lamps falling out of fixtures. Starters may be replaced without disturbing lamps.

Unique features of the Twin Turret lampholder include its easy mounting, the simplified wiring required and its new method

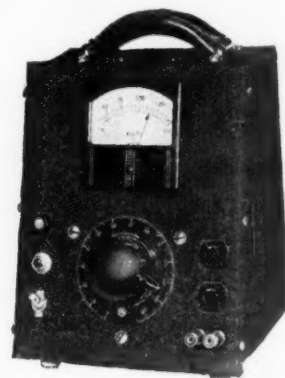
of operation. The lampholder can be mounted on any flat surface with two screws, preferably with lock washers under the screw heads. Tinned and stripped leads can be inserted through entrance holes in the back of the lampholder. Binding screws can be tightened through the holes in the bottom of the lampholder to make permanent pressure contacts.

The method of inserting and removing lamps is a new contribution to fluorescent lampholder design. Each Twin Turret has two discs with holes for the pins of Mazda lamps. Lamps can be inserted by depressing either disc of the Twin Turret lampholder with one end of the lamp until the other end clears the disc in the opposite lampholder and slips into place. Lamps can be removed by simply depressing the face of either Turret with one end of the lamp until the pins on the other end clear the opposite lampholder and slide out of place.

Twin Turret lampholders can be arranged in a number of different ways. It can be used in single, double and triple pairs or special arrangements.

## Voltage Controller

To provide a convenient and easy method of obtaining a variable voltage in the laboratory, in the maintenance shop and on the assembly line, Superior Electric Co., Bristol, Conn., recently added the Voltbox



to their standard line of voltage control apparatus. This new and unusual instrument answers the need for a compact and portable source of variable a-c voltage. It eliminates the bother and delay in collecting and setting-up separate instruments when some voltage other than line voltage is required. By simply connecting the Voltbox to a convenient single-phase outlet, an output variable from zero to considerably above line voltage can be obtained. Accurate voltage setting is assured by an easily read 1% voltmeter prominently displayed on the face of the Voltbox.

Besides a Powerstat variable transformer to set the voltage and the 1% voltmeter, other features incorporated are a dial light output receptacles, binding posts, and an input cord and plug. To prevent overheating, the Voltbox is protected with a circuit breaker mounted on the front panel. The circuit breaker also serves as an "on-off" switch. The type numbers of these Voltboxes are prefixed with the letter "U" to show that the models described are unregulated. Unregulated Voltboxes are offered in two models. Model U-1000 operates from



# HAVE YOU *Checked* YOUR BRUSH REQUIREMENTS LATELY?

Keystone engineers are constantly improving their products to keep pace with the more recent requirements of higher current carrying capacity, less friction, higher speed operations and better commutation.

It is not enough for a Keystone brush to meet ordinary service. It is specifically designed and processed for the particular application on which it will serve and incorporates all recent improvements.

Keystone Brushes, because of their excellent physical properties and many hidden characteristics with exclusive features, are a decided improvement. It will pay you to check your brush requirements first and then check with Keystone.

WRITE FOR CATALOG  
AND PRICE LIST K-15

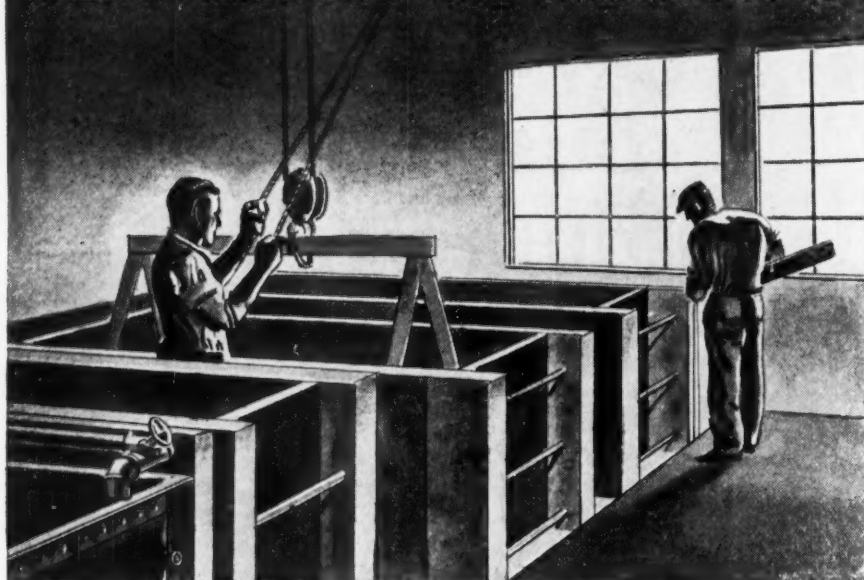
*Keystone Metal-Graphite Brushes for low voltage generator and slip ring applications assure dependable electrical energy at all times. Copper and graphite are carefully proportioned to meet the needs of the individual piece of equipment. The brushes have excellent lubricating qualities and molded-in shunts establish a perfect connection. Your order for popular types and sizes can be quickly filled.*

## KEYSTONE CARBON COMPANY, INC.

*Manufacturers of Precision Molded Products*  
1935 STATE STREET, SAINT MARY S, PENNA.



# For Better Lower-Cost PICKLING METAL CLEANING AND NEUTRALIZING



## ... Check Tank Solutions Frequently This Quick, Simple FERRO Way!



Accurate tests so simple that they can be quickly made by any workman, are helping many companies get better pickling results and, incidentally, saving these companies money.

Ferro Pickle Pills, dropped into a quart milk bottle half filled with the tank solution, will tell you in minutes the amount of iron in a pickling bath . . . or the strength of sulphuric acid . . . or, again, the strength of muriatic acid.

Still other Ferro Pickle Pills are available for testing the strength of alkali in neutralizing baths. And for determining the strength of metal cleaning solutions—in fact, almost any special testing requirement.

Write for full particulars! Better yet, order a trial quantity. You'll find they save time, valuable materials and, even more important, critical man-hours.

## FERRO PICKLE PILLS

a product of

FERRO ENAMEL CORPORATION

Pickling Division

4150 EAST 56 STREET • CLEVELAND 5, OHIO



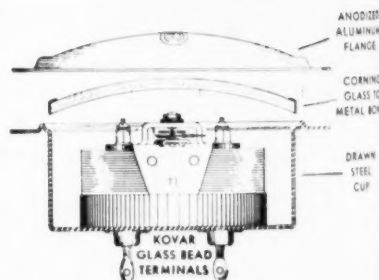
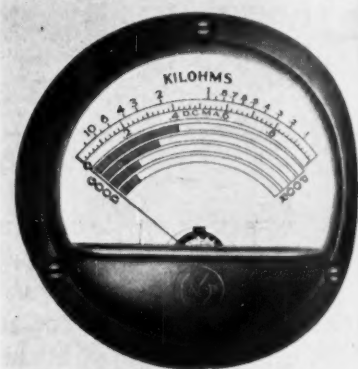
115 volt line to deliver an output variable from 0 to 135 volts at 7.5 amperes while model U-800 has twice the voltage rating and an output current of 3.0 amperes.

When the incoming line voltage fluctuates to the extent that it is impossible to set and hold the voltage to a prescribed value, a Regulated Voltbox is recommended. The regulated models are similar in every detail to the unregulated type except a voltage stabilizer is included. This means constant voltage at any value of output. All component parts are housed in one self-contained cabinet which allows the same flexibility obtained with the Unregulated Voltbox. The Regulated Voltbox is called the R-500. It is designed for operation on 115 volt line with a maximum output of 500 VA.

Further information may be obtained by writing to Superior Electric Co., 563 Laurel St., Bristol, Conn.

### Hermetically Sealed Meters

In applying the principles of vacuum tube sealing, i.e., glass-to-metal, in addition to other design refinements, engineers at the Marion Electrical Instrument Co., Dept.



MF, Manchester, N. H., have achieved true hermetic sealing in their newly perfected hermetically sealed 2½" and 3½" electrical indicating instruments.

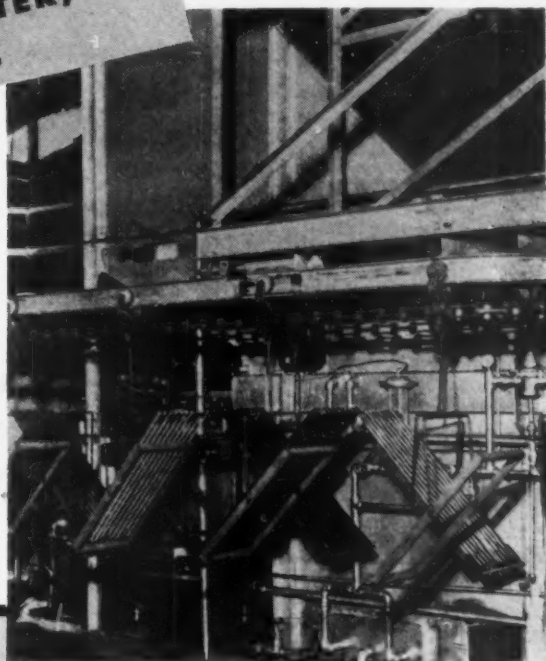
By building the mechanism into a protective cup-like frame, and then sealing the glass cover to the metal rim, positive hermetic sealing has been effected with a minimum number of seals. There are no rubber gaskets or cement seals. Tests have proven the effectiveness of the new type of sealing under severe tropical and/or freezing conditions. The Marion instruments can be immersed in boiling brine solution for weeks, or frozen to minus 40°F., without deterioration of the seals.

The window sealing process was developed



**ELECTROMASTER, INC.**  
**SAY:**

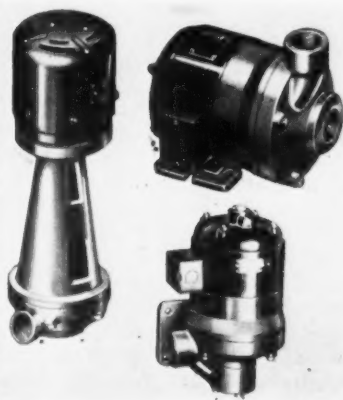
**"CONVERSION  
IS  
NO PROBLEM  
WITH DETREX  
DEGREASERS"**



## 8 PRODUCTION CHANGES SINCE 1941

Early in 1941, Electromaster, Inc., purchased the degreaser shown above. Before they could use it in their regular peacetime production, it was put in operation for the degreasing of bomb fins. Since that time, new contracts for incendiary bombs, bomb burster tube assemblies (pictured), stampings for War Department materiel, and bomb adapters and parts have necessitated minor changes to accommodate the various products. The eighth change has been made only recently.

After the war, this company plans to utilize this same machine for the degreasing of parts for electric ranges and water heaters.



### Centrifugal Pumps

A new line of Superflo Centrifugal Pumps has recently been announced by the Gray-Mills Co., Evanston, Ill.

Higher volume delivery per horsepower and ease of maintenance are features of these new pumps. The heavy duty motors are mounted integrally to the pumps for compactness, strength, and to provide a streamlined design.

The pump motors range in various sizes— $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $1\frac{1}{4}$ , and  $2\frac{1}{2}$  h.p., with volumes of 9 to 75 g.p.h.

There are 13 basic models available with various voltage characteristics.

There are types for horizontal-external mounting; for vertical-external mounting; and other pumps with floating impellers are made for submerging in the coolant system reservoir. The latter may be used for fluids having abrasive content. Grease-sealed motor bearings and mechanical seals of the pumps require no lubrication.

Specifications, performance and construction data, prices and full information may be obtained by writing the Gray-Mills Co., Dept. MF, 1948 Ridge Ave., Evanston, Ill.

**T**HE incendiary bombs dropped by General Doolittle on his first Tokyo raid . . . and thousands now finding their targets in Japan . . . are only a few of the war products which have flowed through this vapor-spray-vapor Detrex Degreaser. Degreasing operations, for weeks at a time, were on the basis of one bomb every three seconds in 24 hour day production.

For other types of products, too, this machine has proved equally as valuable to Electromaster. By changing fixtures and speed of cycle accomplished in only a few hours it was found that any parts of a size which could be conveyed through the machine were degreased thoroughly and efficiently.

Any Detrex Degreaser is immediately adaptable to changing production needs—whether for war or peace.

**DETREX**  
BUY MORE BONDS  
13009 HILLVIEW AVE.  
MICHIGAN  
*Corporation*

# ANODIZING RACKS BY NANKERVIS

George H. Nankervis Co.,  
5408 Commonwealth  
Ave., Detroit, Michigan,  
designs and manufac-  
tures racks and fix-  
tures for every type  
of anodizing and  
electro plating  
service.

The rack shown is one of a complete line of production anodizing fixtures designed to handle every shape and type of part. It pays to use "Nankervis" racks—expertly designed and made, yet costing no more than ordinary racks. Another point: Nankervis specifies and uses BUNATOL for rack insulation; No. 160 for anodizing racks and No. 720 for all other types. BUNATOL rack insulation has, for nine years, been the outstanding insulation in hundreds of shops.

**NELSON J. QUINN COMPANY**  
TOLEDO 7, OHIO

# BUNATOL

## Blast Nozzle

Adding to its present line of Long-Lyfe blast nozzles, American Foundry Equipment Co., Dept. MF, 555 S. Byrkit St., Mishawaka, Ind., is now in a position to supply a complete line of nozzles using the well-known Norbide Borium Carbide inserts—the hardest material made by man.

An added feature to long service life is the jacketing of this insert in an abrasion-resistant alloy steel. The new nozzle is guaranteed for 1,500 hours of service when used with steel shot or grit and for 750 hours when used with silica sand.

Improved blasting efficiency, decreased air consumption, and low hourly costs are among the advantages claimed by the manufacturer.

## New Voltammeter

Simultaneous readings of current and voltage are taken with the new Voltammeter, Model 601, manufactured by Associated Research, Dept. MF, 231 South Green St., Chicago 7, Ill., specialists in electrical instruments for indication, control, and current measurement.

Contained in the sturdy compact case of this one instrument, are an a.c. voltmeter, and an a.c. ammeter, ready for instant use.

The ammeter (at right) measures from 0.2 to 500 amperes in eight current ranges: 0-1, 0-5, 0-10, 0-25, 0-50, 0-100, 0-250, 0-500.

The voltmeter (at left) measures from 30 to 600 volts in three ranges: 0-150, 0-300, 0-600. The voltmeter can also be used on



d.c. at these ranges.

An inserted primary current transformer with 8' secondary leads facilitates the measurement of current on the 0-100, 0-250, and 0-500 ampere scales without subjecting the meter to the stray magnetic fields. User can locate the meter where it can easily be read regardless of the current transformer's location. The range selector switch on the panel permits quick reading of currents in all eight ranges.

Large instant reading scales have white backgrounds with figures in jet black covered by glass, and mounted at rear of panel.

The strong metal case is provided with stout carrying strap. Size of case is 12 1/2" x 9 1/2" x 10". Weight packed for shipment 25 lbs.

## Zinc Stripper

All-Brite Chemical Co., Dept. MF, Waterbury 89, Conn., has announced the development of "Zinc-Strip", an alkaline agent for stripping defective zinc plate and zinc plating racks without danger of attacking the steel base. The company claims that "Zinc-Strip" can be used for stripping Zinc coatings, dull, bright or galvanized. A thickness of about .0002" Zinc plate may be removed in approximately one minute. No new equipment is required wherever an ordinary steel tank used for cleaning is available.

"Zinc-Strip" is supplied in dry form to approximately 400 pounds to the drum and added to water just prior to using. For literature and technical consultation service is available on request. Samples of Zinc plated work will be stripped in the laboratory of the company and returned for inspection without obligation.





## Business Items



Arthur A. Schuenemann

The Udylite Corporation, 1651 E. Grand boulevard, Detroit, announces the appointment of Arthur A. Schuenemann as metal finishing service engineer. Mr. Schuenemann is a graduate of Ohio State University. He was formerly employed by the General Electric Company and for the past ten years has been with the Harshaw Chemical Company, doing research and service engineering.



William Henry Moyer

Udylite also announces the appointment of William Henry Moyer as Philadelphia representative and service engineer operating out of Udylite's New York office. Mr. Moyer is a graduate of Bethany College, Pennsylvania, and was formerly plating control chemist with the Jacobs Aircraft Engine Company of Pottstown, Pa.

Resumption of its pre-Pearl Harbor expansion program will be undertaken by Minnesota Mining and Manufacturing Co., St. Paul, in the immediate postwar period with construction of a new 400,000 square foot "Scotch" tape addition to its St. Paul plant and a colorquartz roofing granules plant in the South.

Announcement of these plans was made by W. L. McKnight, president, on behalf of the board of directors of 3-M Company. The announcement came hard on the heels of an announcement that a Minnesota Mining and Manufacturing Co. subsidiary, the Inland Rubber Corp. of Chicago, has been authorized by the government to build and

**DRIES QUICKLY AT ROOM TEMPERATURE**



**UNICHROME\***

**"AIR DRY" RACK COATING**

### Easy to apply—but hard to wear off

A few dips in the handy, open-end drum—and your plating racks are coated with a tough, resilient insulation that you can count on to stand up through cycle after cycle of trouble-free operation.

The remarkable properties of the special resins used in Unichrome "Air Dry" Rack Coating account for its extreme resistance. Continuing research in selecting and formulating these resins gives you maximum protection at minimum cost . . . an insulating coating effective in all plating cycles where an air drying material can be used. Write to nearest office for prices or a trial order.

\*Reg. U. S. Pat. Off.

### UNITED CHROMIUM, INCORPORATED

51 East 42nd St., New York 17, N. Y. • 2751 E. Jefferson Ave., Detroit 7, Mich. • Waterbury 90, Conn.

#### PROPERTIES

**Chemical Resistance**—Excellent for all plating cycles.

**Toughness**—Withstands repeated flexing and shop handling—cuts cleanly and easily at contacts.

**Drying**—Dipped in container in which it is shipped and dried at room temperature.

**Adherence**—Excellent.

### TRY THESE OTHER UNICHROME MATERIALS

**Unichrome Coating 202**—a new rack insulation, similar to "Air Dry" but which is force dried to obtain the extra adherence required in anodizing and hot, strongly alkaline solutions.

**Unichrome Quick Dry Stop-Off 322**—for cyanide copper and other plating work requiring an extremely adherent stop-off.

**Unichrome Quick Dry Stop-Off 323**—for

chromium and other plating work requiring a stop-off that can be peeled off after use.

**Unichrome Resist**—a solid insulating material for constructing composite racks, stop-off shields, insulating gaskets, etc.

operate a \$7,000,000 plant at Ottawa, Ill., in the government's latest step to help meet the shortage of military tires.

The additions, including equipment, are estimated to cost some \$4,000,000, and funds have been earmarked to carry these projects to completion as soon as wartime restrictions on materials and man-power are lifted. Approximately \$2,500,000 is to go into the St. Paul plant. These expansions are part of a 3-M Company growth program which was in progress when the United States entered the war, and resumption of which is a major postwar aim of the company.

The new St. Paul addition will be a four-story structure, similar in construction to the other plant and will be joined by openings which will be cut through.

The new structure will be 508 feet long and will have an average depth of 200 feet. It is designed to bear eight stories if future expansion is desired. In addition,

a one-story building 75 feet by 50 feet, will be constructed at the west end of the new building, to house rubber compounding equipment.

The Phillips Manufacturing Co. and the Phillips Chemical Co. both of Chicago, Ill., are pleased to announce the appointment of Frank J. Kenney of Syracuse, N. Y., as their distributor for that area of New York State from Rochester east, excluding the Metropolitan New York City area and including the state of Vermont.

Mr. Kenney who has been very active in this area for many years will handle the complete line of Phillips metal cleaning machinery, including vapor degreasers, alkali washers, wax melting tanks and plater's tanks as well as the line of Phillips controlled cleaning chemicals. Mr. Kenney's address is 815 James St., Syracuse 3, N. Y.

*For Better and  
Faster Cleaning!*

## **"PENOTRITE"**

### **ROOM TEMPERATURE DEGREASING SOLVENTS**

- ✓ Right at the Bench
- ✓ Along the Production Line
- ✓ Prior to Painting
- ✓ Before Plating
- ✓ For Final Cleaning

*for complete information write*

**GENERAL SOLVENTS COMPANY**  
INCORPORATED  
926 EXCHANGE ST. ROCHESTER, NEW YORK

## **The ABBOTT Method**

★ TEST WORK REPORT  
on your parts



### **DEBURRING**

Parts of odd shapes and sizes, which seem to be a problem, are being successfully deburred by the ABBOTT Method . . . The Abbott metallic materials are available in shapes and sizes to insure contact on practically all types of small parts.

**TRY IT!**

★ TEST WORK REPORT  
Send a few unfinished samples  
and get a Test Work Report  
—it's free and will give the  
facts. . . .

**THE ABBOTT BALL COMPANY** 1046 NEW BRITAIN AVE.  
HARTFORD 10, CONN.

The Hanson - Van Winkle - Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies, will receive during this year, a Golden Anniversary Certificate from the *National Association of Manufacturers*, as a founding company which has been outstanding in contributing to American industrial progress.

Mixing Equipment Co., Inc., of Rochester, N. Y., manufacturers of the well-known "Lightnin" and "Mixco" mixers and agitators, announce the addition of a new representative. He is *George R. Mellema* and his offices are located at 1024 Plymouth Building, Minneapolis 2, Minn. His territory will include Minnesota, North Dakota, South Dakota and the extreme Western section of Wisconsin.

C. E. Mason has been appointed technical director of the *Bristol Co.*, Waterbury 9, Conn., manufacturers of automatic control and recording instruments, according to an announcement made by *L. G. Bean*, vice



C. E. Mason

president in charge of engineering and sales.

Mr. Mason was graduated from Marietta College in 1917. After service during World War I as a pursuit pilot in the U. S. Army Air Service, he became interested in engineering problems in the petroleum industry and practiced consulting engineering in Tulsa until 1925, which led to his specialization in automatic control problems. From 1925 until 1941 he was associated with the *Foxboro Co.* and for several years of that period he was director of control research. From 1940 until joining the *Bristol Co.* he was director of engineering of the *Massachusetts Neilon Regulator Co.*

Mr. Mason has written many papers on the basic principles of automatic control, which have been published in the technical journals. He has been actively associated with many technical groups studying the science of automatic control and is an active member of the *Committee on Theory of the International Instruments & Regulator Division of the American Society of Mechanical Engineers.*

To streamline present activities and to prepare for post-war operations, **United Chromium, Incorporated**, announces the opening of a new district office in Dayton, Ohio, and



**L. A. Critchfield**

the appointment of two men, well-known in midwest territory where they have been active for many years, as district managers.

**L. A. Critchfield** is now managing the district office at 845 North Main St., Dayton, Ohio, and will supervise activities in Southern Ohio and Indiana, West Virginia, Kentucky, Tennessee, Alabama and Mississippi. He joined **United Chromium** in 1940, with an excellent background of technical training and more than 15 years research and production experience in metal finishing. Although operating out of Detroit since that time, he is equally well known in Eastern electroplating circles. Formerly in charge of the plating and polishing division of **Hamilton Watch Co.**, he served as vice-president of the **Philadelphia Branch** and later founded the **Lancaster Branch** of the **American Electroplaters' Society**.



**R. H. Dudley**

**R. H. Dudley** has been made Detroit District Manager in charge of Michigan, Northern Ohio and Indiana, and Western Pennsylvania.

## Ingenious New Technical Methods

Presented in the hope that they will prove interesting and useful to you.

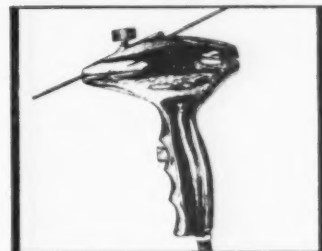
### Highly Versatile "Pencil Weld Gun" Welds Cold... Corrects Flaws and Defects ... Saves Man Hours, Materials

The **Pencil Weld Gun**, used with its **Vibra-Weld Transformer**, offers simplicity and versatility never before known in the industry. Equally effective in correcting flaws and defects in both ferrous and non-ferrous metals—for welding cold, without setting up stresses or crystallization.

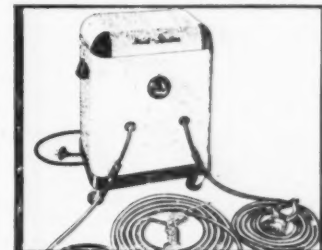
**Simple in Operation**, the **Pencil Weld Gun** requires but a few moments' practice to achieve results formerly unobtainable with any method. Utilizing a combination of air, high amperage and low voltage, the weld never exceeds 125° to 130° F. The gun uses a pure aluminum or nickel rod, which is applied directly to the defective area. When the surface has been finished and polished off, it is impossible to detect the repair. Easy to use, as gun peens and welds simultaneously. The **Pencil Weld Gun** and **Vibra-Weld Transformer** can be used wherever 220 volt single phase electricity and air outlets are available.

Unavailable, however, is **Wrigley's Spearmint Gum**. As the makers of **Wrigley's Spearmint** are unable to continue manufacture of the product up to their quality standards under present conditions, the only unqualified protection they can give to the consumer and the dealer alike is to keep the **Wrigley's Spearmint wrapper empty**. While they advertise this empty wrapper, none is being made and any found on the market is old production of a perishable product.

You can get complete information from  
**Mid-States Equipment Company**  
2429 South Michigan Avenue, Chicago 16, Illinois



Close-up of new Pencil Weld Gun



Pencil Weld Gun with Vibra-Weld Transformer

Z 66

He is a graduate industrial chemical engineer and has been with **United Chromium** since 1929, specializing in sales and service engineering. Having a broad practical experience in the installation and operation of metal finishing processes, **Mr. Dudley** enjoys a wide acquaintance among manufacturers and job platers in the East as well as in the Mid-West. The Detroit sales office together with a research laboratory and pilot plant is located at 2751 East Jefferson Ave.

**Howard M. Marie** is now representing **Rheem Research Products, Inc.**, Baltimore, manufacturers and marketers of **Iridite**, in the Southern New Jersey, Pennsylvania, Maryland and West Virginia territory. Mr.

**Marie** has, for the past twenty years, been closely associated with the metal finishing and electroplating industry.

**Rheem Research Products, Inc.**, Baltimore, has formed a new marketing division to promote and broaden the use of **Iridite**, and to develop new product ideas.

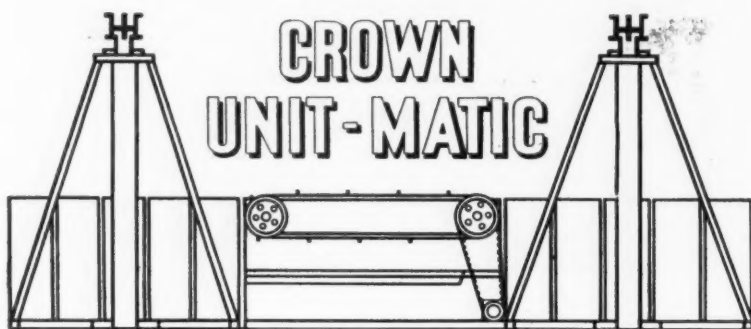
Under the direction of **Harry C. Irvin**, the marketing division will work directly with basic industry on corrosion problems. Chief product of the company is **Iridite**—a corrosion-resistant finish for zinc and cadmium plated surfaces, zinc die castings and hot-dip galvanized products.

**Jules Horelick** has succeeded **Mr. Irvin** as superintendent of the Baltimore plant.



# Crown

BRINGS TO THE PLATING INDUSTRY THE OUTSTANDING EQUIPMENT DEVELOPMENT DURING THE PAST QUARTER OF A CENTURY

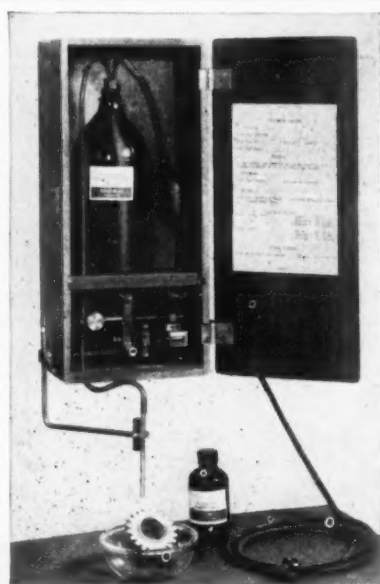


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FULLY AUTOMATIC  
PARTIALLY AUTOMATIC  
EQUIPMENT

FOR  
PLATING  
ANODIZING  
CLEANING  
PICKLING

CROWN RHEOSTAT & SUPPLY CO.  
1910 MAYPOLE AVE. CHICAGO, ILL.



THICKNESS  
OF  
ZINC • CADMIUM  
TIN • COPPER

can now be determined  
with the new electrically  
operated

KOCOUR  
AUTOMATIC  
DROPPING  
UNIT

Write for literature.

KOCOUR CO.

4720 S. Christiana Ave.  
Chicago 32, Ill.

Specify Kocour Sets from your supplier.

The Hanson - Van Winkle - Munning Co., Matawan N. J., announces with regret the retirement of their Secretary and Director, Nelson Todd, who leaves to go into other fields. Mr. Todd, who has served with the company for 29 years, has contributed greatly to its welfare. His associates have publicly expressed their appreciation of his work with them, and their best wishes for his future success.

N. A. Munning, formerly Assistant Treasurer, has been elected secretary of the company.

The Ferro Enamel Corp., Cleveland, Ohio, doubled the facilities of its Engineering Department, with E. W. Dany in charge as Chief Engineer. Drafting-room area has been increased 100% and newest type lighting and ventilating equipment has been installed. Office-space has also been increased.

Black-Ox Chemical Co. of Newark, N. J., manufacturers of various types of black oxide compounds for the chemical treatment of ferrous and non-ferrous metals, has announced the appointment of Mr. Victor



Victor Michaels

Michaels as manager of its Field Engineering service for the Eastern District. Mr. Michaels, who for many years has specialized in this field, will make his headquarters at the company's home office, 754 McCarter Highway, Newark, N. J.

The Cowles Detergent Co. announces the appointment of Clarence G. Ozar to the staff of their metal cleaning service laboratory. Mr. Ozar received his degree in chemistry from the University in Detroit and comes to Cowles after twelve years' experience in the metal working industries.

Mr. Ozar's technical background and practical experience make him an extremely valuable addition to the company's rapidly expanding metal cleaner department. He will assist directly in solving metal cleaning problems both in the laboratory and in the field.



Keen Johnson

Keen Johnson, for the past year an assistant to the president of the Reynolds Metals Co. has been made a vice-president. Mr. Johnson, a former governor of Kentucky, has offices in Washington. This promotion to vice-presidency is coincident with the retirement, because of ill-health, of W. G. Golden, vice-president, who was active in the Reynolds organization for many years.

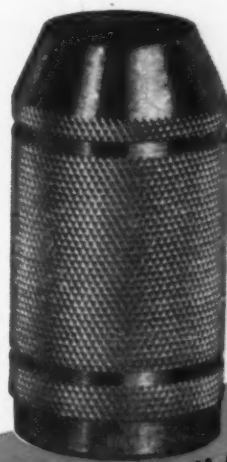
Reynolds Alloys Company, a Reynolds Metals subsidiary, has named Mr. A. J. Phillips, vice-president, as general manager of its plant at Listerhill, Alabama. It also announces the naming of David P. Reynolds as a director and of Robert Weiller as a vice-president. David P. Reynolds is vice-president of Reynolds Metals Company in charge of advertising and public relations and aluminum sales.

Announcement has been made of the organization of the Peninsular Chemical Products Co. which will manufacture complete lines of protective coating materials for the plating industry and for other industrial uses.

President of the new company is M. C. Brennan who is also president of General Industrial Products Co., New York; International Railway Car and Mfg. Co., Kenton, Ohio, and B and D Gage Tool Co., Detroit.

Associated with him will be three former executives of Michigan Chrome and Chemical Company of Detroit. Vice-President in charge of sales is W. A. Nelson who previously was head of chemical products sales for Michigan Chrome. C. J. Weine, who was chief chemist of the same company, also becomes a vice-president of Peninsular and will be in charge of all chemical production and research. E. H. Ploe, who in his previous connection was responsible for purchasing, priorities and personnel, is secretary and treasurer.

The company has purchased a plant at 6795 East Nine Mile Rd., Van Dyke, Mich., and are starting immediate production of rack coating lacquers, masking lacquers and tape, stop-off wax, maintenance paint and specialized protective coatings for industrial purposes. A layout dye, used as a background for preparing scribed layouts on metal, will also be manufactured.



YOU CAN'T MARK TOOLS  
"DO NOT HANDLE!"

That's why the graphic story of Luster-on, told in these unre-

touched photographs of a bit brace chuck means so much to manufacturers of tools or other zinc-plated items.

Luster-on is an easily-applied, chemical bright dip which gives zinc the stable, passive corrosion-resistance of cadmium — protecting parts from unsightly finger-marking and age stains. Yet Luster-on is available now for your products.

The above photos show clearly how successfully Luster-on treats both knurled and smooth surfaces — gives them mirror-like brilliance, and long-lasting tarnish resistance. Investigate Luster-on, the economical protective finish.

KEMO SAYS: Send us a sample of your zinc or zinc-plated items for free processing with Luster-on. See for yourself how it can improve your products.

**THE Chemical CORPORATION**  
93 Broad St., Springfield 5, Mass.

**THE CHEMICAL CORPORATION**  
93 Broad St., Springfield 5, Mass.

Please send me full particulars about Luster-on bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name .....

Address .....

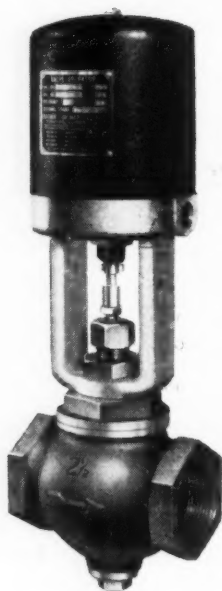
Metal Finishing, May 1945



COMPOUNDS: Burring, Cutting Down, Polishing, Mirror Finishing.  
A CEMENT: Used for setting up Wheels, Belts, Buffs & etc.

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## BARBER-COLMAN



TYPE FYSA  
SEMI-BALANCED VALVE

Write for Bulletin  
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## MOTOR-OPERATED VALVES FOR INDUSTRIAL SERVICE

Barber-Colman electric motor-operated Valves offer a number of advantages for all types of process and other control systems associated with industrial equipment. They will provide reliable shut-off for gases and liquids because of positive power-driven seating, and can also provide accurate motor-driven positioning for proportioning service. Current is consumed only when the valve is changing position. Motors are available for either low-voltage or high-voltage lines. These valves are made in a wide range of sizes and types, for accurate, dependable service.

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## Associations and Societies

### American Electroplaters' Society Indianapolis Branch

The Indianapolis Branch of the American Electroplaters' Society held its regular meeting April 4, 1945, at the Hotel Riley. A dinner was served at 6:30 P. M. and the business meeting was called to order at 8:30 P. M. by our president, A. L. Chesterfield. The secretary's and treasurer's reports were read and approved.

A short discussion was held on plans for a dinner dance to be given by the Branch in the latter part of May or early part of June. Mr. Chesterfield said he would appoint a committee to work out the details of the dinner dance and that they would make a report to the members at the next meeting.

Mr. Wm. M. Martz was elected to active membership in the Indianapolis Branch.

Mr. A. J. Wurster and Sherwood (Peter) Rickert of the Industrial Filter and Pump Company, spoke to the members of the Indianapolis Branch. Mr. Wurster told of some of the most common troubles encountered with pumps and explained how they can be eliminated. Mr. Rickert gave a demonstration showing how the bags of the filter became pre-coated with a filter aid and he also showed how the bags were cleaned by the use of compressed air without tearing down the filter unit.

The meeting was adjourned at 9:40 P. M.  
Carl A. Morris,  
Secretary and Treasurer.

### Los Angeles Branch

With an attendance averaging 65 to 80 at the morning and afternoon business sessions and 320 at the banquet in the evening, the 15th annual educational session of Los Angeles Branch, A. E. S., was held at the Los Angeles Breakfast Club on March 24.

The educational program was presented at morning and afternoon business sessions, beginning at 10 A. M. and 1 P. M., respectively, with a recess in between for a club luncheon.

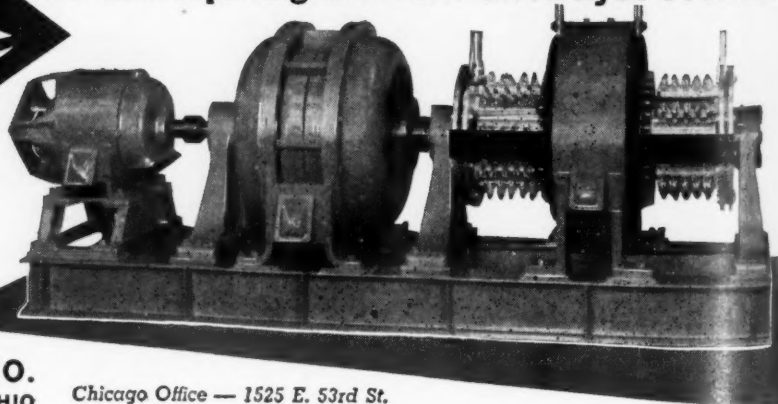
The program of the business sessions included what probably was the finest lineup of

## MOTOR GENERATORS by COLUMBIA

Columbia Generators embody every feature essential for dependable, 24-hour operation. They are built for electroplating service in sizes of 6 to 20 volts, 500 to 20,000 amperes, for anodic treatment of aluminum in sizes of 40, 50, and 60 volts, 500 to 3,000 amperes. Columbia Generators for other electrolytic processes range from ½ to 250 KW, 100 to 40,000 amperes, 6 to 60 volts. Write for full information.

COLUMBIA ELECTRIC MFG. CO.  
4519 HAMILTON AVE., N.E. • CLEVELAND 14, OHIO

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Chicago Office — 1525 E. 53rd St.



speakers from the standpoint of a diversification of timely subjects that the Branch has presented at any of its annual conventions. There were four speakers representing outstanding midwestern manufacturers of plating equipment and chemical supplies, and one local speaker.

The first speaker was *Marshall Wells* of the *Westinghouse Electric Co.'s* Southern California division. His subject was "Electronics in Use Today." Mr. Wells had delivered an excellent talk on "Illumination A- It Pertains to the Plating Industry" at the February 12 meeting of the Branch, and was invited to appear on the program of the annual educational session to present an elaboration of his February theme combined with a discussion on electronics.

After a one-hour recess for lunch from 12 to 1 o'clock, business discussions were resumed with the introduction by Chairman *Earl Coffin* of *P. L. Pine* of the *Harshaw Chemical Co.*, Cleveland, O. Mr. Pine delivered a talk on "The Importance of Purity in Plating."

The other speakers included *William Jackson*, *Udylite Corp.*, Detroit, Mich., on "Plating Barrels and Their Application"; *L. R. Davidson*, president, *Sturgis Products*, Sturgis, Mich., on "Automatic Barrel Burring, Honing and Coloring"; and *Fred P. Green*, *Crown Rheostat & Supply Co.*, Chicago, on "Modern Plating Equipment." Question and answer periods were held after each speaker concluded his talk.

The annual banquet and dance was held in the ballroom of the Los Angeles Breakfast Club between 7 P. M. and midnight. *Miss Betty Gordon*, accomplished accordioniste, who has appeared at the last three annual banquets of the Branch, enlivened the dinner hour with personal serenades of various dignitaries.

Introductory remarks at the evening affair were made by *Marcus D. Rynkojfs*, general chairman of the program committee. Dance music for the annual ball was by *Art Whiting* and his orchestra, in addition to which a floor show of special entertainment features was offered.

Proceeding on the plausible theory that the future of any organization lies with its younger members who must carry on as the responsibility is handed down to them from the founders, Los Angeles Branch of the A.E.S. continued its policy of advancing

## ECONOMICAL, DECORATIVE **SPEKWITE** QUALITY PLATED FINISH

### **Tarnish Resisting...Faster Plating...Lustrous Finish**

SPEKWITE plates quickly and directly on nearly all metals, and covers hard solder and most soft solders. Soldering and welding are easily accomplished on SPEKWITE plated work. Extremely high throwing power enables it to penetrate deep recesses. Used extensively on Government work. SPEKWITE has high salt spray resistance (about 1½ times nickel for same thickness), and is *non-magnetic*. Articles can be formed after plating without cracking or peeling. Plating can be controlled by plater at tank, or by laboratory. Ideal for plating in a steel tank, basket and barrel. *Economical*—only 1 lb. of SPEKWITE plates about 100,000 sq. in. minutes of work. Reflectivity is high—82% of silver.

ORIGINAL PATENTED COMPOSITION FOR DEPOSITING  
A TRI-METAL ALLOY PLATE OF COPPER, ZINC AND TIN.  
U. S. PATENT NO. 2,079,842 ISSUED MAY 11, 1937.

### **DRASTIC NEW REDUCTION IN PRICES**

afforded by considerable savings in manufacturing costs.  
SPEKWITE costs less than nickel plating for the same thickness.



#### WRITE FOR LITERATURE

Data sheets describing SPEKWITE in detail—advantages, properties, characteristics and price—will be sent promptly on request. There is no obligation.

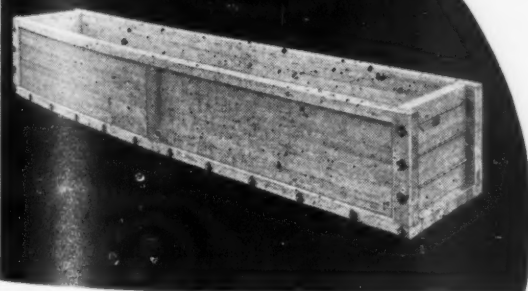


**SPECIAL CHEMICALS CO.**

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Excellent service on all types of Wood Tanks.

The shortage of metals has increased the demand for wood tanks for plating and pickling service. We can give excellent service on all types of tanks. Send us your inquiries.

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KALAMAZOO - MICHIGAN

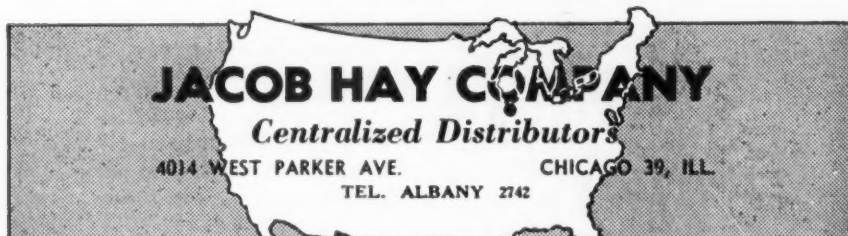
## CLEAN-RITE All-Purpose CLEANERS

ANODES  
BLACK OXIDE SALTS  
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CHEMICALS  
CLEANERS  
COMPOSITIONS  
ELECTROPLATING EQUIPMENT  
LACQUERS  
PLATING RACKS  
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Let us help you solve your problems.  
Take advantage of our practical experience.



MODERN

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NEW

# STRIPIT No. 400

Positive Removal of Baked Enamels from Any Metal.

1. Immediate Stripping Action
2. More Economical
3. Less Odor
4. No Base Metal Attack

Send samples for stripping in our laboratory without obligation.  
Consult us on your metal finishing problems.

**ALL-BRITE CHEMICAL CO.**  
WATERBURY 89, CONN.

capable representatives of the younger generation to positions of importance in the Branch by electing *E. W. Wells*, sales engineer of *Chas. F. L'Hommedieu & Sons Co.* to the presidency at the April 9 meeting in Hotel Rosslyn.

Mr. Wells had demonstrated his capacities for leadership while serving as first vice-president during the past year and by handling various committee assignments in a capable manner during the past several years.

For first vice-president the Branch chose *D. N. Eldred*, representative of the Pacific Division, *E. I. DuPont de Nemours & Co.* Mr. Eldred, one of the best-liked members of the Branch, has given unselfishly of his time and effort to A. E. S. activities for many years.

*Harry Woodward* was named to the important post of second vice-president, which carries with it the chairmanship of the membership committee.

*Frank Bunker* of the *L. H. Butcher Co.* executed the duties of secretary-treasurer during the 1944-45 term so capably that he was a "natural" for re-election, the membership insisting that he be retained in that post for another year.

*Jack Bell* of the *A. J. Lynch Co.* was chosen librarian, succeeding *Earl Coffin*.

The new board of directors is composed of *Ernest Lamoureux* (chairman), who was named to head this important department in tribute to the tireless and unselfish efforts he devoted to those duties last year, when he served as chairman of the Board as well as editor and guiding spirit of the committee which produced the magnificent 120-page 1945 program and directory. Other members of the Board of Managers are Retiring President *Joseph Sunderhaus* and Retiring Librarian *Earl Coffin*, to round out an exceptionally capable trio on the Board.

A discussion was held on the present format and editorial policy of the *Monthly Review*. Opinions were expressed to the effect that the editorial content of the *Review* in recent months appeared to have deviated from its previous policy of publishing a liberal quota of technical papers, both as originating in papers read at the various Branches, and in papers written specially for the *Review*. A wide variety of technical papers, various members emphasized, was the most desirable feature of the *Review* in the past, and the publication of more such papers each month would be welcomed by the members of this Branch, it was stated.

*D. N. Eldred* and *Ernest Lamoureux* were appointed to a committee which is to make a study of past issues of the *Review* with the view of making recommendations to the Branch for improving the publication, which recommendations are ultimately to be forwarded to the *Supreme Society* office as reflecting the opinions of Los Angeles Branch members and what they would like to see appear in the *Review*.

### Toronto Branch

The April 13th meeting of *Toronto Branch* of the A. E. S. opened at 8:40 P. M. President *Byers* requested *Mr. Acheson* to speak with reference to the recent sudden death of *Mr. Thomas O'Keefe*, one of the ablest and most respected members. At the con-

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## 99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and its own supply of the basic raw material Chrome Ore from company owned and operated mines, Mutual is the world's foremost manufacturer of Chromic Acid.



**Bichromate of Soda**  
**Bichromate of Potash**

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**OF AMERICA**  
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by JOSEPH NOVITSKY

- We specialize in plating racks of our own patent.
- Constructed without screws, rivets, solder, brazing, welding.
- We design racks to suit your individual problem.

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(Phone—REpublic 9-7223)

...sion of the remarks the members stood in  
...ence for one minute in respect for their  
...parted friend and associate. Mr. O'Keefe  
...me to Toronto in 1915 and assumed charge  
...the plating department of the *Standard*  
...ter Company. He was formerly employed  
...the *International Silver Co.* under Mr.  
...os. Brosman, at Wallingford, Conn. Mr.  
...O'Keefe was a valued member of Toronto  
...branch and will be greatly missed by the  
...tire membership. He leaves a widow  
...formerly *Ethel Stroup*, of Parksburg, Pa.),  
...and two daughters.

W. S. Barrows announced the sudden  
...ath of the beloved Past Supreme President,  
...Mr. Frank J. Hanlon. News of Frank's death  
...was a shock to all his many friends.

One applicant was elected to active mem-  
...bership. An offer from Ottawa which may  
...permit use of a government experimental  
...laboratory there, was read and referred to  
...the executive committee for consideration.

New officers for the coming year are:  
...Pres.—James Vaughn. 1st Vice-Pres.—Frank  
...Oakley. 2nd Vice-Pres.—John McRoberts.  
...Librarian—Don Walker. Recording Secre-  
...tary—John Acheson. Sgt.-at-Arms.—Wm.  
...Price. Trustees—Ben Cameron, Chas. Kem-  
...ish, Geo. Harris. Secretary—Ted Blandey.  
...Treasurer—Mel Green.

Special feature for the evening was a  
...ecture by Mr. G. E. Bourne, of the *Canadian*  
...General Electric Co., who gave an interesting  
...demonstration and talk on "Electrically  
...Operated Thickness Gauges." Mr. Bourne  
...began by telling of earth magnetism and  
...gradually carried through the development  
...of instruments designed to measure practi-  
...cally anything that is known today. He  
...made special mention of three types of in-  
...struments which may be used to measure  
...thickness of electrodeposited coatings, and  
...explained in detail the operation of each  
...type. Nickel being magnetic cannot be mea-  
...sured by these instruments if deposited over  
...iron or steel base. The gauge can be em-  
...ployed for measuring thickness of deposits  
...on rods, tubes, and the rims of holes, and a  
...great variety of non-metallic coatings. Mr.  
...Bourne also interested and amused his listen-  
...ers by showing some of the funny things  
...that can be done with "Bouncing Putty."  
...Various types of magnets were shown and  
...the magnetic properties peculiar to each were  
...explained. A "Floating Bar" was particu-  
...larly interesting. A hearty vote of thanks  
...was tendered Mr. Bourne for his splendid  
...lecture.

Allan Byers installed the newly elected  
...officers without the usual formalities.

The speaker for the meeting of May 11th  
...will be Dr. C. J. Wernlund, of the *Du Pont*  
...Company, Niagara Falls, N. Y. The subject  
...will be "Potassium—Hi Speed Copper Plat-  
...ing Process."

Meeting adjourned at 10:40 P. M.

W. S. Barrows.

### American Society for Testing Materials

The A.S.T.M. Executive Committee at its  
...meeting on April 10 decided to cancel the  
...five-day regular Annual Meeting of the So-  
...ciety (scheduled for Buffalo, June 18-22  
...incl.) and instead to plan for a business  
...session or sessions to be held probably the





In the new Globe Tumbling Barrel Catalog, partially illustrated above, you will find the final solution to your finishing problems. It contains complete information about the nine different types of Globe Barrels in their various sizes and capacities. You will find that there is a Globe Tumbling Barrel for almost every type of finishing operation—de-burring, burnishing, polishing, painting, japanning, or drying. All of them are designed to provide finer finishing at less cost. This new catalog plus Globe's Finishing Service Department are waiting to serve you. Write today!

**Here Are Seven Ways That Globe Tumbling Barrels Will Reduce Your Finishing Costs**

1. You can process thousands of pieces at one time.
2. You do not need specially skilled labor.
3. One man can operate several barrels simultaneously.
4. The purchase price of Globe barrels is low.
5. You have practically no upkeep.
6. Your operating expense is mainly power consumption which is negligible.
7. You obtain superior results.



# **BOUND VOLUMES** OF **METAL FINISHING** **1943 and 1944\***

**PRICE \$7.00**

**BOOK ORDERS PAYABLE IN ADVANCE**

*\*Ready for distribution about June 1st*

last week in June in New York City. This will permit actions on the formal standards to be consummated and Society business to be conducted. Also cancelled is the Exhibit of Testing Apparatus and Related Equipment which had been scheduled for the Annual Meeting. These actions were taken in full cognizance of the transportation situation and after consultation with officials of the Washington Committee on Conventions and the O.D.T.

The Society will proceed with the printing of its technical papers and reports that would normally have been presented and these will be distributed to the members as is customary. The Society's technical committees are holding meetings at various times and places and its work on specifications and tests for materials continues intensively.

Another phase of work will be undertaken namely, "the study, development and standardization of methods of tests of materials, parts, and assemblies, in actual or simulated service conditions." A detailed report on this work appears in the March Bulletin. There have been numerous recommendations that the Society undertake work in this field which is of growing importance and it is felt A.S.T.M. can render considerable service here as it has done in the strictly materials fields for so many years.

## **News from California** **By FRED A. HERR**

After the newly compiled 1945 Program-Directory of *Los Angeles Branch* of the A. E. S. had been distributed late in March, the general reaction of Branch members and the West Coast plating industry as a whole was to the effect that the Branch "... certainly had turned out a fine job."

And a "fine job" the 1945 Directory truly is without exaggeration. The booklet unquestionably is one of the most complete as to content and format that has been sponsored by any Branch. It would seem to this writer to be a "must" on the reference shelf of every plater, not only in the territory of the sponsoring Branch, but as well in other sections of the country.

The Program-Directory is a 6 x 9 inch, 120-page booklet printed on heavy, glazed book paper. While the title page refers to it as the "Official Program Directory of the 15th Anniversary of Los Angeles Branch," the booklet is so thoroughly well compiled, its technical matter so carefully chosen and its listings of Branch members and Pacific Coast plating shops so complete that its value as a reference volume to industry members will become apparent after only a cursory examination.

The Directory lists alphabetically the names and addresses of the 139 members of Los Angeles A. E. S. Branch of record as the copy went to press. It also lists alphabetically the names and addresses of 132 job shops on the Pacific Coast and the names and addresses of 97 Pacific Coast manufacturers who operate plating departments or metal finishing divisions of their own.

The job shops are listed for Phoenix, Ariz.;

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Salt Lake City, Utah; Seattle and Tacoma, Wash.; Portland, Ore., and the following California cities: Los Angeles, San Francisco, Oakland, Alameda, Beverly Hills, Emeryville, San Bernardino, San Jose, Selma, Pasadena, Long Beach, Glendale, San Diego, Berkeley, Hollywood, Downey, Inglewood, Burbank, Monrovia, Upland.

Additional value of the Directory lies in the care General Committee Chairman M. D. Rynkofs and Editor Ernest Lamoureux exercised in the selection of technical data for inclusion in the volume.

Highlighting the technical material are eight lead articles prepared by Branch members thoroughly conversant with the subjects assigned them. The articles are:

"Magnesium Protective Treatments," by Dean D. Williams, Materials and Process Engineer, North American Aviation, Inc., Inglewood, Calif., and "Anodizing of Aluminum," also by Mr. Williams.

"Is there an All Purpose Cleaner for Platers?" and "Water Conditioning Removes Another Variable from Plating," both collaborations by Emmet R. Holman, chief chemist, and Carl Hirdler, research engineer, Turco Products, Inc., Los Angeles.

"Government Plating Specifications," by Don M. Bedwell, head of Bedwell Plating Co., Los Angeles.

"Electroplating Solutions and Processes," by D. N. Eldred, DuPont Co., El Monte, Cal.

"Selection of Solutions for Pickling Sterling Silver," and other data, by Joseph Sunderhaus, plating superintendent, Olds Band Instrument Co., Los Angeles.

"Gold Solutions for Production Work," by J. L. Merigold, formerly head of the Merigold Plating Co., Los Angeles, now retired.

Also included is a two-page listing of U. S. Standards for builders' hardware, giving comparative symbols and other data; and a listing of international atomic weights.

A happy idea by the compilers and editors was the use of a series of solutions and short items of technical information which are inserted in fine print at the tops of pages. There are 50 such items distributed through the book, dealing with such subjects as solutions for tinsmith's solder, plumber's solder, stripper for lead anodes, onyx finish on metal, instant determination of tank capacity, spotting out on metals, bright dip for copper-brass, how to preserve belts, and others. With

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## does the job when you use Gripmaster!



### One Grade Grips All Grains — 250 to 20

**RIGHT you are!** It's easy to do away with complicated stacks of polishing wheel adhesives. When you use Gripmaster, one grade grips all grains—250 to 20. It is not even necessary to bother with a special sizer. Gripmaster serves as both sizer and cement! Join the swing to simplicity. Send for a free sample of Gripmaster—the new kind of polishing wheel cement that steps up polishers' production on average of 47% more pieces per head!

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NO OBLIGATION. SEND ON  
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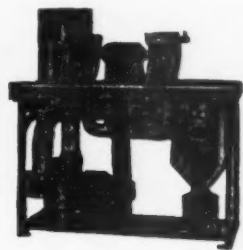
PAT. PEND.

### POLISHING WHEEL CEMENT

GRIPMASTER DIVISION: MICHIGAN BLEACH & CHEMICAL COMPANY  
1944 EAST WOODBRIDGE, DETROIT 7, MICH.  
IN CANADA: NELSON CHEMICAL COMPANY, WINDSOR, ONTARIO



Blower



Polishing Bench



Dryer



Tubbing



Sawdust Box



Sandblast

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the subject matter of these items limited to two to four lines of fine print, this method of listing miscellaneous items of technical information has elicited much favorable comment

The Program-Directory was compiled by a general committee composed of *M. D. Rynkofs* (chairman), *Frank C. Rushton*, *C. E. Thornton*, *Ernest Lamoureux*, *Joseph Sunderhaus*, *Frank Bunker*, *E. W. Wells*, and *Carl Klinfelder*.

Mr. Lamoureux served as editor, assisted by a technical committee in the selection and preparation of data, composed of the following: *Don Bedwell*, *D. N. Eldred*, *Earl Coffin*, *Emmet R. Holman*, *Howard Woodward*, and *D. D. Williams*.

The Program-Directory has been distributed to all members of Los Angeles Branch, and to manufacturers and distributors of plating equipment and job shop and plant-shop operators along the Pacific Coast.

## Manufacturers' Literature

### Electric Timer

A new electric timer bulletin, No. 1100, has just been released by the *C. H. Stoelting Co.*, Industrial Division, Dept. MF, 424-P North Homan Ave., Chicago 24, Ill.

The new bulletin describes table model

stop clocks, wall model stop clocks, precision chronoscopes, combination timers and impulse counters, stop watch controllers, and spring wound X-ray timers.

These Stoelting timers have wide application in industrial and laboratory testing, such as in measuring start-to-stop intervals of relays and instruments and for checking sequence operations. Circuit diagrams are included to show correct methods of connecting the various timers in test circuits.

### Polishing Wheel Bulletin



Illustrates, describes and outlines uses of all kinds of Polishing Wheels such as the many types of Muslin, Canvas, Sheepskin, Bull Neck and Felt Wheels—also special purpose wheels.

Bulletin 101 is available on request to

*The Manderscheid Company*, Dept. MF, 605 West Washington St., Chicago 6, Ill.

### Sander

Simultaneously with the introduction of the new Sand-O-Flex all-purpose sander, the manufacturer has released an informative four-page folder explaining how this new sanding device sands, burrs, finishes and polishes small wooden, metal, plastic and rubber parts quickly and effortlessly. The Sand-O-Flex is a brush-backed sanding wheel that is particularly effective on irregular surfaces and on jobs that were formerly done only by hand. It can be used on stationary and flexible shafts, or on portable electric tools. The folder will be of especial interest to manufacturers with unusual sanding, burring and finishing problems. Copies are available by writing to *Exactone Tool & Die Co.*, Dept. MF, 4373 Melrose Ave., Hollywood 27, Calif.

### Rectoplater

The *Udylite Corp.*, Dept. MF, 1651 East Grand Blvd., Detroit 11, Mich., has published a new 4-page folder announcing the *New Udylite-Mallory Rectoplater*. The folder illustrates and describes the Senior Model VM-1500A and the "Junior" Model 6SPS-400.

Copies of the folder or further information on the Rectoplater may be obtained by writing to the company at the above address.



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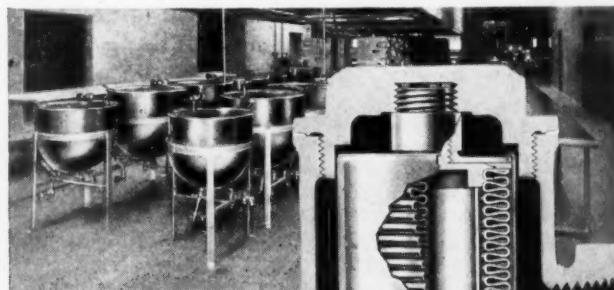
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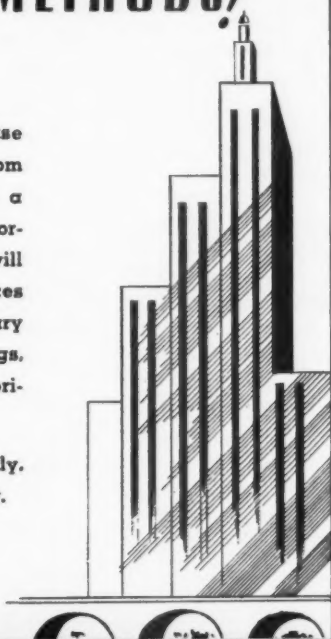
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## SHOP PROBLEMS

(Continued from page 212)

### Determining Plating Costs

**Question:** I would appreciate it very much if you would furnish information on the following: How is the price of "Hard Chromium Plating" arrived at? I am familiar with the cost estimating of bright work and barrel plating work and to a fair degree with straight tank work; but I must confess I am at a complete loss as to how to arrive at a fair hard chromium price estimate. We will use the following piece which we had in recently as an example; the part was a cylinder 14 inches in length, with a diameter of 3 inches, the hard chromium was to be plated on the inside surfaces to a total of 0.0250" inside diameter or 0.0125" on each side. What in your opinion would have been a fair price for the work on this part?

R. A.

**Answer:** Costs will vary according to a great number of factors, and it is not possible to arrive at a price without knowing such things as tank capacity, rate of deposition, condition of pieces, service required by customer, number of pieces received in each shipment, etc.

These conditions vary with each lot, and in every plant, so you can readily understand that it is not possible to make a general estimate.

### Old English Finish

**Question:** We would appreciate considerably if you would advise us the process for finishing brass parts with an "Old English" finish. Parts concerned are brass fireplace sets consisting of stand, shovel, poker, tongs, etc. At the time of completion of machining operations, the parts are a high brass finish and it is desirable to treat them so that they have the dull "Old English" brass finish.

I might also mention that we have enjoyed receiving your magazine "Metal Finishing." We use it consistently for reference and have obtained considerable information from it. Past copies are kept on file in our laboratory.

D. R. C. LTD.

**Answer:** Old English finish or English Bronze requires two solutions:

Solution I—Liver of sulfur or liquid sulfide oxidize— $\frac{1}{2}$  oz./gal.

Solution II—Copper sulfide—2 ozs./gal.

The brass article is cleaned, dipped in Solution I and then into Solution II, without an intermediate rinse. It is then rinsed, and the cycle is repeated as often as is necessary to obtain the desired shade, after which the article is rinsed and scratch brushed. If a dull finish is desired, brass should be scratch brushed wet with pumice and water before oxidizing.

### Removal of Annealing Scales

**Question:** Enclosed are some watch cases which have a film of carbonized grease on

the outside. Can you tell us how to remove this film without using a brush?

These parts become blackened passing through an annealing furnace. Have you a chemical or acid which you would recommend to clean these parts?

S. H. G. Inc.

**Answer:** The usual procedure is to pickle these cases in a hot 10-20% solution of sulfuric acid. The temperature is not critical, and may range from 120°F. to boiling.

### Gun Metal Finish

**Question:** Will you kindly let me have a formula for a gun metal finish directly on a brass base? Thanking you in advance for your response.

B. B.

**Answer:** We would suggest the following formula:

White arsenic	20 oz.
Copper sulfate	10 "
Hydrochloric acid	1 gal.

This solution may be operated at room temperature, but works better if hot. For a darker color, one pound of ammonium chloride may be added.

### Stripping Chromium Plate

**Question:** Will you please give me information as to stripping chromium plate from anodized parts?

C. J. M.

**Answer:** We do not know of any process whereby chromium plate is applied to anodized parts, but in any case, chromium can be removed from aluminum by treating with

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reverse current in a sulfuric or chromic acid solution.

### Anodizing Literature

**Question:** I should like to secure a reasonably complete list of recent publications, books and articles covering the various anodic treatments (anodizing) of aluminum.

N. J. B.

**Answer:** This is rather a large subject, but we would advise that the January issues of *Metal Finishing* during the last few years have had articles covering the developments of the previous year in this field.

### Eliminating Dullness

**Question:** We have set up a small hard chromium plating solution for small tools and mandrels in accordance with instructions in your *Plating & Finishing Guidebook* of 1944, recently received.

Our plating on the original surface, is very satisfactory, but we are having trouble on the parts that we want to strip and replat.

At the present time we are stripping the tools in a sodium hydroxide solution, as outlined on page 145 of the above book, at full current strength (1,000 amps.). The results are as you can see on the enclosed sample, in varying degrees of dullness. Can you suggest what we can do in order to bring back the original brightness, or eliminate the dullness we are now obtaining?

W. R.

**Answer:** The sample forwarded with your inquiry leads us to believe that you may be passivating the surface during the stripping operation. We would suggest that you try the following procedure after removing all the old chromium:

Polish lightly with a fine grade of greaseless compound, clean in alkali, rinse, dip in 50% muriatic acid solution, rinse, reverse current etch in chromic or sulfuric acid and chromium plate as usual.

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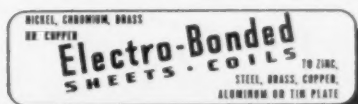
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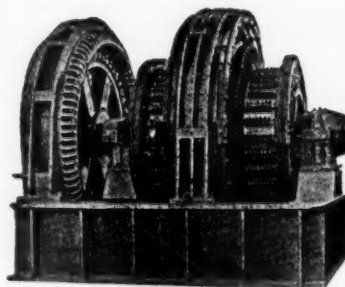
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## ODDS and ENDS

During the last few years it has seemed to us that everyone and his brother has gotten into the metal cleaner business, and the shortage of trained men has resulted in the industry being overrun with salesmen who are only salesmen, when they should be cleaning specialists. We could name offhand a couple of dozen men of our acquaintance in this field, who are welcomed with open arms when they walk into a plant because their knowledge of detergency has been of great practical assistance in the solution of cleaning problems. Such men, unfortunately, are not of the majority and the cleaner salesman has too often become the subject of ridicule in our industry.

This month, at the risk of calling down upon our head the maledictions of certain sensitive souls, but with the hope of awakening them to the vanishing prestige of their important segment of the metal finishing supply industry, we are turning this page over to the man with a message, in the person of BILL KEESE, who, as general manager of a company manufacturing and selling cleaners, has been in a position to see the change at first hand.

Mr. Keese's opinions are, of course, his own and do not reflect the editorial policy of METAL FINISHING. However, we do not feel that we should retreat from controversial subjects of importance, and the remarks, which may or may not be taken seriously, should provide food for thought and may explain why many cleaner salesmen are beginning to wonder whether buyers consider them human beings.—Ed.

### How to Get Rid of Cleaner Salesmen

By Wm. M. Keese

ACCORDING to purchasing agents, chief chemists, metallurgists, and heads of plating departments in war plants, the trains the last two years have been largely full of two classes of characters—stock chasers—(pardon me, Expeditors)—out on the road trying to buy practically everything else, and cleaning salesmen trying to sell cleaning compounds.

According to the above theory, with which I have no argument, ours is about the only war industry which has stayed on a competitive basis. By that same token, we may not do so badly after the war—at least our salesmen have had to keep in practice! Anyway, we have one great consolation—we are about the only fun the poor purchasing agents still have! They greet the tool salesman, the die salesman, the steel salesman—every other kind of salesman (pardon me—

Engineers) on bended knee, asking only "Can I get it?" But let one of us life-savers to his old time hauteur stick but a nose in the door and he looks at our card with a nostalgic sneer and repeats, "Another cleaning salesman, eh!" It's fun for them, and I wonder if it is for our own fault.

Since all metal to be further processed, even with a simple preservative, must first be clean, since you can get grease and oil off some metals with anything from caustic soda on up, and since anybody who can put ten dollars can put spikes in an old barrel, turn it with a crank, and thus have himself a mixing plant, no wonder quite a few cleaning compound companies have either grown huge or have started from nothing and have some business.

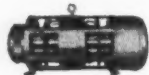
The author (who, by the way, cheerfully admits he is not a cleaner salesman—he is still playing the piano at the old spot) recently had the pleasure of being all ears at a select gathering consisting of the chief metallurgist for one big aircraft plant and the chief chemist and the anodizing director of another, for a whole evening of chit-chat between the three on strictly technical problems. Early in the discussion, however, before the talk got technical, this matter of the locusts plague of cleaner salesmen came up. Not being a salesman myself, I could and did agree with the boys that there ought to be a sort of atabrine for this epidemic and we pretty well agreed on one which is the message of this short diatribe.

In the first place, if the misguided cleaner salesman, either through ignorance or the routine of the particular plant, gets to Purchasing first, he should, as soon as the Buyer has enjoyed his well earned and (these days) all-too-rare sneer, be referred to the actual plant who says yes or no on what cleaner goes in the tanks in the plant in question, be he Chemist, Metallurgist, Plater, Liaison Engineer, or what. This latter gentleman, in spite of the fact that he has plenty else to do, should then create and dispose of the corpus delicti substantially as follows:



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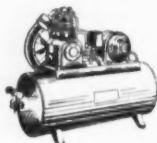
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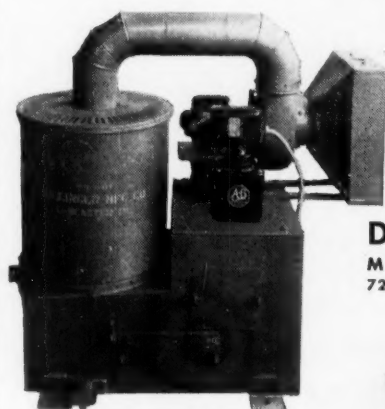
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This party in authority should employ a sort of routine, to conserve his own energy, consisting of leaning back in his chair or on his desk if he has given the salesman the only chair, accepting a cigarette or package of same, or carton of same, from the salesman, and inquiring, in a friendly sort of voice—"Why the H— did Purchasing send you in here? . . . Where are you from? . . . Have you got anything new? . . . if so, what is it? . . ."

The salesman will then, 99 chances out of 100, make the routine answer to this standard opening by stating, in as mellifluous a voice as possible, that he has the honor to be presenting something the Authority has unfortunately missed—namely, the best and greatest cleaning compound in the world for aluminum, steel, or brass, as the case may be, and would the Authority come down to the hotel later in the afternoon for a bit of demonstration of it and perhaps also some throat-cleaning material the salesman has by chance in his grip down at said hotel.

You can take it from there—any of you. You've been through it. Not only is the particular cleaning compound the greatest thing since Columbus and Remus first learned to wash their ears in ancient Rome, but also you must hear how Their Chemist (if it's a small outfit), or Their Research (if it's a big outfit or is trying to sound like one), dreamed up this particular poison in the dark of the moon as a result of untold calls to ailing war plants in a Consulting Capacity, etc., etc. Then, when you finally get the salesman down to cases, and it gets down to the metal to be cleaned, the results wanted for subsequent processing, and products available therefor, the Super-Market really opens. You are given the choice of number 19X, 48C, 1999P, or what have you, with the bland and glorious assurance that if one doesn't work the others may!

At this point, the Authority, having already missed a couple of things he should have done in the preceding half-hour, should gently but firmly usher the salesman, with a mumbled word about "appointments—so sorry"—through a door marked "Lobby," which actually opens either into the alley or, preferably, a small but well-polluted creek, thus not only saving himself further time, but also abating a nuisance on the premises.

All of which leads to a bit of serious consideration of what can be done by us in the cleaning business to earn your business and save you time. After the following few remaining generalities, we will offer a few concrete suggestions and then close before you usher us into the Lobby.

In the first place, we who are in the business of making cleaning compounds are, if we make useful ones, entitled to make a living just the same as human beings! Your desk, or at least your buyers',

should know just who is who in your plant about the choice of the materials we offer, and should send us to them at the first convenient appointment time, which we should make fit the already onerous duties of your Authority. We have valued customers where it took us six months to even find out who the real Authority was! No wonder we have to get money for cleaners—think of all those shoes and man-hours!

In the second place, your Authority will save a lot of his own time if he comes out and says, after learning the purpose or purposes for which cleaner No. 9999 is being offered—"We are (or are not) getting along OK with Whosis Cleaner No. XX, which we use to clean X metal before X process. What is it about your cleaner that makes you think we can save money, time, or trouble by a change-over, especially when a changeover to your product, if it *doesn't* work, may make me catch H— for a halt in production?"

On the salesman's answer to this question should depend whether he goes immediately out the door marked "Lobby," or takes up some more of your time. If he doesn't know what's in the cleaner you use now, and if he doesn't know what's in his, so that he is not only willing but able to tell you his will work better, not just "because," but for definite reasons dependent on the ingredients and the theory behind their use—throw him out! He hasn't got the dope to help you.

If he comes back with the other stuff we mentioned above—all about the great mystery, and secrecy being his only protection in this wolfish business, also throw him out. I've spent a lot of time with both the professional talent and the production talent of this war effort, and I never heard any of them tell a man from another war plant "it's secret." Ninety-nine times out of a hundred they say "come over and we'll show you."

The beautiful thing about the cleaning business and the bad thing about it, is that nobody knows *all* the whys and wherefors—let us be the first to admit it. But those of us who have had to produce results with what knowledge there is, have come to have a practical feeling for results needed, and a sort of veterinarian ability to use the materials at hand to accomplish it. We have sort of come to know what each alkaline horse or solvent tractor or wetting-agent bulldozer will do in a pinch and in combination with the rest of the team.

We should have no hesitation in telling people, in some cases, that instead of hiring the team they should go buy some caustic soda or nitric acid or a pail of kerosene. On the other hand, if it is a team job, then you can afford to listen but if we can't tell you *why*, with *what*, and *how*, with some theory of substantiation—throw us out the door marked "Lobby."

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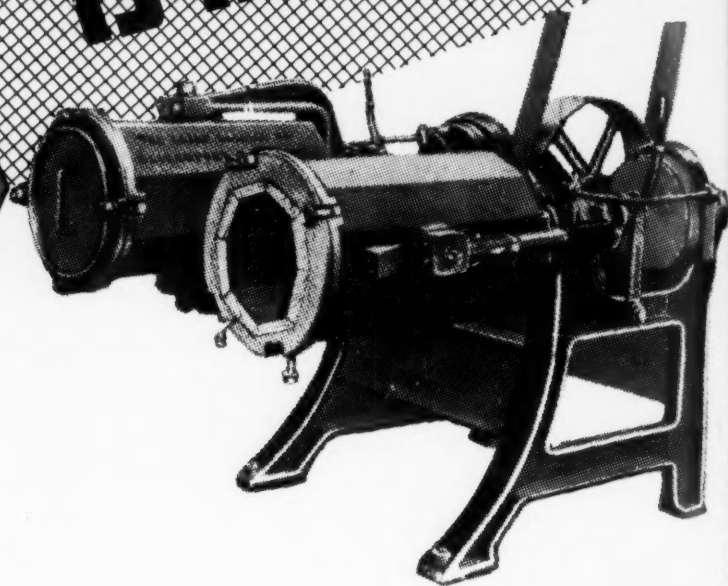
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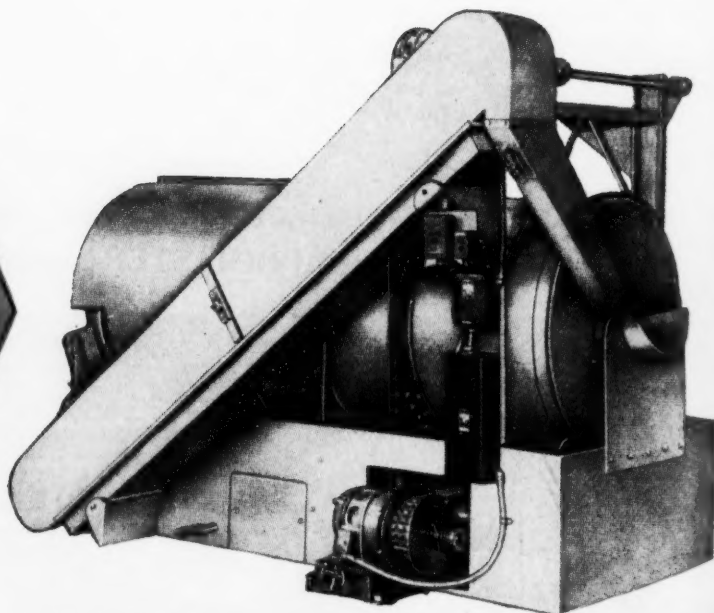
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